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CONTRIBUTIONS TO THE MOSQUITO FAUNA OF
SOUTHEAST ASIA. - IV

Species of the subgroup *Chrysolineatus* of group D,
genus *Aedes*, subgenus *Finlaya* Theobald

by

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CONTRIBUTIONS TO THE MOSQUITO FAUNA OF SOUTHEAST ASIA. - IV.

SPECIES OF THE SUBGROUP *CHRYSOLINEATUS* OF GROUP D,

GENUS *Aedes*, SUBGENUS *FINLAYA* THEOBALD¹

By

Kenneth L. Knight²

INTRODUCTION

This is the first of a series of revisionary papers on the *Aedes* (*Finlaya*) mosquitoes of Southeast Asia. Groupings of species, believed to be natural because of the common possession of numerous structural and biological characters, will be sought within the subgenus and treated one by one. The inter-relationships of these groupings will be described and discussed in the terminal paper. Until the appearance of that paper, the intra-subgeneric classification of Knight and Marks (1952) will be used where possible.

Species which occur near to, but outside of, Southeast Asia are included in the keys wherever possible. The larval and pupal chaetotaxy used is that of Belkin (1962). An asterisk following the abbreviations used (♀ = female, ♂ = male, L = larva, P = pupa) indicates that at least some portion of that sex or stage is figured. All types of included species which are in the British Museum (Natural History) and the United States National Museum have been seen by me. Attention is drawn to the fact that the thickness of many of the larger larval hairs have been over-exaggerated in figures 5, 6, 7, 8, 9 and 10.

Abbreviations used in the references to literature conform to the World List of Scientific Periodicals, 3rd ed., Academic Press, 1952.

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GENUS *Aedes* MEIGEN
 SUBGENUS *Finlaya* THEOBALD
 GROUP D, *Aureostriatus*
 SUBGROUP I, *Chrysolineatus*

The classification used here is that proposed by Knight and Marks (1952) who divided Group D into 8 subgroups of which 3 occur in Southeast Asia, namely, Subgroup I, *Chrysolineatus*; Subgroup II, *Aureostriatus*; and Subgroup VI, *Togoi*.

Group D, *Aureostriatus*

Tentatively distinguished by the following: scutal pale scaling includes a pattern of narrow longitudinal lines, this pattern in a few species occasionally obliterated by a general diffusion of pale scales. Femora and tibiae not lined anteriorly with pale scales for nearly their whole length. Tarsi with basal pale scaling on some segments. Wings not extensively spotted with areas of pale and dark scaling. Larval, pupal, and biological characteristics will be added to this definition in subsequent papers.

Subgroup I, *Chrysolineatus*

The members of this subgroup have many characters in common. Consequently, in order to simplify the species descriptions which follow, these characters are summarized here and will not be repeated unless subject to extensive variation or used as species-separation characters.

FEMALE. *Head.* Torus with a patch of small broadened scales mesally; palpus about one fifth to one fourth length of proboscis, dark scaled, usually some pale scales apically; proboscis dark scaled, some species with areas of pale scaling; vertex with a longitudinal median band of narrow pale scales, this band widened posteriorly into a broad sparse patch, a line of similar scales along median half of eye margins, a submedian area of dark scales between ocular pale line and posterior patch of narrow pale scales; lateral portion of vertex with broad pale scales, small anterior patch of dark scales usually visible medially in this area; forked upright scales abundant dorsally from eye margin to occiput and usually all dark. *Thorax.* Anterior pronotum with a dense cover of broad pale scales, sometimes a few narrow scales present; posterior pronotum variably scaled; propleuron with a patch of broad pale scales, this patch continuing onto the anterior surface; scutum with brown integument, covered with small narrow brown and pale (yellow or golden) scales, pale scales arranged in narrow longitudinal lines as follows: a full length median line, a full length submedian line interrupted at scutal angle, anterior end of posterior portion of this line usually curved outward to a variable extent along scutal angle, and a line of variable extent over wing base which may be just a diffused area in some species, a small patch of long narrow-curved pale scales just before wing base, narrow pale

scales present along anterior margin of scutum from end of submedian line to dorsal posterior pronotal scales; scutellum with sparse narrow dark scales on lateral lobes, occasionally pale scales occurring there, mid lobe with broadened appressed dark scales laterally, a median longitudinal area of narrower pale scales (extent of this area variable); pleuron with a patch of broad white scales on each of following areas: postspiracular, lower prealar (hereafter called the "prealar scale patch"), upper sternopleural, lower posterior sternopleural, and upper half or more of mesepimeral, some species also have scales on paratergal and subspiracular areas. *Legs.* Coxae with broad white scales, fore and mid coxae also with dark scales ventrally and fore usually with some white scales antero-ventrad to dark scales; fore and mid femora with anterior surface dark except often for a narrow fringe of pale scales basally, pale scales variably present elsewhere; posterior surface of fore femur with a broad dorsal white band from near base to apex, may be interrupted or diminished towards apex; posterior surface of mid femur with basal half largely white, this white continued along apical half as a ventral band; anterior surface of hind femur with a broad white area from near base to near middle, connecting ventrally with a similar area on posterior surface (actual location and extent of this area variable with species), dorsal surface usually dark along whole length, apex white beneath, this extending apico-dorsally a variable amount onto both anterior and posterior surfaces; tibiae dark, with a baso-ventral (baso-anterior in some cases) white area, posterior surface of fore and mid tibiae lined with pale scaling in some species; tarsi with basal white bands present on some segments; tarsal claws equal, fore and mid each with 1 tooth, hind simple. *Wing.* Dark scaled, nearly always a ventro-basal line of white scales on costa. *Halter.* Knob with dark and pale scaling. *Abdomen.* Terga with dorsal pale markings usually present; prominent basolateral white spots present, lateral margin of I with silvery-white scaling; sterna dark scaled, most with basal white bands.

MALE. In general, similar to female. *Head.* Palpus about 0.75-0.80 length of proboscis, segments straight, not noticeably swollen or curved, nearly hairless except for a few bristles at apices of segments III-V (may also be a very few laterally along the shafts of segments IV-V in some species, up to about 7 lateral hairs on each side of IV and about 4 on each side of V); vertex with upright forked scales pale medially, dusky laterally, sometimes all pale except on submedian dark-scaled areas. *Legs.* Fore and mid tarsal claws unequal, the larger claw with a normal median tooth and a finer acute latero-basal tooth, smaller claw with a sub-basal tooth; hind claws equal, simple. *Wing.* Dark scaled. *Abdomen.* Tergum of segment I with lateral margin white scaled, remainder of terga with prominent baso-lateral white spots, some segments with dorso-basal pale scaling or complete basal bands. *Terminalia.* Segment IX with tergal lobes small but prominent, each bearing a number of strong setae; sternum with 1-3 long setae, usually 1-5 smaller setae, and sometimes 1-3 small scales; basimere long and rather narrow, densely scaled, mesal surface membranous, remainder distinctly sclerotized, dorsal surface without an apical lobe, usually without a basal lobe, with 30-60 short setae scattered along mesal margin,

about 7-20 of these somewhat clustered in area where a basal lobe would be if there were one, 1-5 of the setae along mesal margin more strongly developed than remainder, lateral and ventral surfaces with numerous very long setae; claspette composed basally of a pilose stem bearing 1-6 distinct setae, and apically of a sickle-shaped filament (elliptically tubular in cross section) which is slightly longer than the stem; distimere simple, bearing 1-2 setae apically; terminal appendage simple, about 0.20-0.25 the length of distimere itself; phallosome with aedeagus simple, short, when normally expanded apically it is of rather even width throughout; paraproct with a single apical tooth, 1-4 cercal setae on each side.

PUPA. (Figure 11.) *Cephalothorax*. Hair 1-C at least twice as long as hair 2-C; 10-C mesad of 11-C; 11-C greatly elongate, single.

Abdomen. Hair 1-II usually well developed, with 2 or more branches; 2-I and 3-I approximated; 2-VI well mesad of 1-VI; 3-I-III greatly elongate, single; 5-IV-VII noticeably elongate, single; 6-VII approximately similar to 9-VII in development, with 2-5 simple or barbed branches which may be forked; 9-I-VI minute; 9-VII similar to 6 but usually larger and with more branches; 9-VIII larger than on VII with 3-14 simple or barbed branches which are usually forked; 1-P elongate, approximately equal to 5-VII in development; paddle margins usually with some fine submarginal spiculation apically, minutely and sparsely fringed on basal half. Minor differences occur between the species included here but none has been found to be sufficiently great or stable to permit species determination.

LARVA. (Figure 12.) *Head.* Antenna moderately long and of even width with sparse minute spiculation; hair 1-A usually inserted just beyond middle, with 1-5 branches (usually 2-3); head hair 4-C very small, with 2-7 branches; 6-C with 3-9 and 7-C with 3-9; bases of 4-6-C usually in a rather even transverse line anterior to antennal bases in unflattened heads; 5, 6-C with stiff branches which are of rather equal length and arranged in a fan-like manner; median mouth brush hairs with comb-like tips; mentum with 10-14 lateral teeth, first 2-4 more widely spaced. *Abdomen.* Hair 1 most prominent dorsal hair on III-VII; 6-I-II with 1-4 branches (usually double), with 1-5 on III-VI, branches unequal in length (nearly equal in *chrysolineatus*); 7-I-II with 1-3 branches (usually single); hair 13 most prominent ventral hair on III-VII, with 1-6 branches on III-V, single on VI, and with 1-4 branches on VII; 1-VIII with 1-5 branches, 2-VIII and 4-VIII single, 3-VIII with 4-10, and 5-VIII with 2-6 branches; comb consisting of a patch of scales; siphon hair tuft inserted in area of, or just beyond, middle, with 3-7 plumose branches; pecten consisting of 8-27 dark teeth, each tooth usually slightly larger than the more proximal one, teeth basad of hair tuft bearing 1-4 ventral denticles; segment X with pilose integument; saddle incomplete, posterior margin clothed with spicules of varying development; ventral brush consisting of 10-13 tufts, normally all arising from grid; gills 1.5 to 4 times longer than saddle, approximately equal in length.

DISTRIBUTION. Throughout the Oriental Region, with representatives in the adjacent portion of the Palaearctic Region.

TAXONOMIC DISCUSSION. The grouping of species created by this definition has more the characteristics of a "superspecies" than it does of a

"group" as used by Edwards (1932). The *chrysolineatus* subgroup is presently considered to include the following species: *chrysolineatus* (Theobald), *formosensis* Yamada, *harveyi* (Barraud), *japonicus japonicus* (Theobald), *japonicus shintienensis* Tsai and Lien, *jugraensis* (Leicester), *koreicus* (Edwards), *nigrorhynchus* Brug, *rizali* (Banks), *saxicola* Edwards, and *sherki* Knight. All of these species, except *koreicus*, occur in the Southeast Asian Region.

The species of this subgroup differ so slightly from one another that any but perfect specimens are frequently difficult to identify. Species determinations are most satisfactorily made from a combination of larval and adult characters. Male terminalia and pupae almost totally lack adequate identification characters.

BIOLOGY. Without exception, the larvae of this group of species occupy "container-type" habitats, particularly rock holes, tree holes, and plant axils. On occasion, the immature stages of some species are found in artificial containers. Several of the species have been taken in human biting catches and it is likely that all of the members of the subgroup do, at least on occasion, feed on man.

KEY TO THE SPECIES - MALES AND FEMALES

1. Scutum with median longitudinal pale line not forked posteriorly (Figure 1) 2
- Scutum with median longitudinal pale line forked posteriorly at prescutellar space (Figure 1) 4
- 2(1). First 4 hind tarsomeres with basal white bands *sherki* (p. 27)
- Only first 3 hind tarsomeres basally banded 3
- 3(2). Prealar scale patch continuous with upper sternopleural scale patch (Figure 2) *jugraensis* (p. 19)
- Prealar scale patch distinctly separated from upper sternopleural scale patch (Figure 2) *rizali* (p. 22)
- 4(1). Proboscis all dark scaled 5
- Proboscis with pale scaling present 9
- 5(4). Mid femur with anterior and antero-dorsal surfaces dark apically; female torus with dark scales only 6
- Mid femur with anterior and dorsal surfaces white just before apex (Figure 2); torus with white scales 7

- 6(5). Posterior portion of submedian scutal pale line anteriorly bent along scutal angle to area of lateral line and of lateral scutal margin (♀). *nigrorhynchus* (p. 20)
 Posterior portion of submedian scutal pale line anteriorly bent along scutal angle only briefly, well separated from lateral margin. *saxicola* (p. 25)
- 7(5). Hind leg with first 4 tarsomeres basally white banded, may be a few basal pale scales on the fifth; subspiracular area with a line of broad white scales; Korea, China, Japan
koreicus
 Hind leg with first 3 tarsomeres basally banded; subspiracular area without scales 8
- 8(7). Female median upright forked scales of head mostly pale; anterior pronotal lobe with some narrow curved scales dorsally; Taiwan, Ryukyus.
japonicus shintienensis (p. 17)
 Female median upright forked scales of head mostly dark; anterior pronotal lobe with oblique band of broad white scales; Japan, China. *japonicus japonicus* (p. 15)
- 9(4). Paratergite and usually subspiracular area each with a small patch of broad white scales (Figure 2).
formosensis (p. 10)
 Paratergite and subspiracular areas without scales 10
- 10(9). Female proboscis with ventral pale-scaled area broadly produced laterally and, to a somewhat lesser extent, dorsally in general area of middle; male proboscis with narrow white band medially *chrysolineatus* (p. 8)
 Female proboscis with ventral pale scaling not visible, or only very slightly so, from above; male proboscis with pale scaling visible at joint laterally or even from above, but not forming a sharp complete band *harveyi* (p. 13)
 (♂) *nigrorhynchus* (p. 21)

KEY TO THE FOURTH STAGE LARVAE

1. Abdominal hair 1-X basally 2-3 branched 2
 Abdominal hair 1-X single, occasionally divided sub-basally 3

- 2(1). No pecten teeth inserted beyond siphon hair tuft; abdominal integument not showing distinctive pilosity
nigrorhynchus (p. 21)
- Three to 6 pecten teeth inserted beyond siphon hair tuft; abdominal integument heavily pilose
vizali (p. 23)
sherki (p. 28)
- 3(1). Metathoracic hair 7-T with stubby branches, distinctly different in shape and development from hair 6-M (Figure 8) 4
- Metathoracic hair 7-T with greatly elongate tapered branches, generally similar in shape and development to hair 6-M (Figure 3) 5
- 4(3). Comb consisting of about 15-20 scales; siphon hair tuft with tip exceeding siphon apex; pecten teeth with 1 well developed ventral denticle before middle, no teeth beyond base of siphon hair tuft (Figure 8)
jugraensis (p. 19)
- Comb consisting of about 50-70 scales; siphon hair tuft with tips not attaining siphon apex; pecten teeth with 1-2 very small ventral denticles medially or with none, 3-6 teeth inserted beyond base of siphon hair tuft (Figure 10)
saxicola (p. 26)
- 5(3). None of the branches of the siphon hair tuft attaining apex of siphon plus valves 6
- Some, at least, of these branches reaching to or beyond apex of siphon plus valves 8
- 6(5). Head hair 5-C with 9-22 branches; comb scales with fine spicules basally, coarser ones apically, usually 1 apical spicule more strongly developed; siphon blackish, index about 1.5-2.0, with 8-13 pecten teeth (Figure 4)
formosensis (p. 11)
- Head hair 5-C with 3-7 branches; comb scales with fringing spicules rather even in development; siphon not blackish, index approximately 3.0-3.5, with 15-29 pecten teeth 7
- 7(6). No simple pecten teeth beyond base of siphon hair tuft; saddle with mostly spiculate scales on posterior margin
koreicus
- Usually 1 or more enlarged simple teeth beyond base of siphon hair tuft; saddle with mostly simple spines on posterior margin (Figure 6)
japonicus japonicus (p. 16)
japonicus shintienensis (p. 18)

- 8(5). Individual comb scales expanded apically; denticles of pecten teeth small (Figure 5) *harveyi* (p. 13)
 Individual comb scales distinctly tapered to a stout central spine; denticles of pecten teeth large, elongate, conspicuous (Figure 3) *chrysolineatus* (p. 9)

Aedes (Finlaya) chrysolineatus (Theobald)
 (Figures 1, 2, 3)

Hulecoeteomyia trilineata Leicester 1904 (non Theobald 1901), in Theobald, Entomologist 37: 163 (♂, ♀); Theobald 1907, Mon. Cul. 4: 220 (♂, ♀); Edwards 1922, Indian J. med. Res. 10: 466 (synonymy).

Howardina chrysolineata Theobald 1907, Mon. Cul. 4: 218 (♀).

Culex ? *japonicus* var. *ceylonica* Theobald 1910, Mon. Cul. 5: 391 (♀); Edwards 1932, in Wytsman, Genera Insect. fasc. 194: 151 (synonymy).

Aedes (Finlaya) chrysolineatus (Theobald), Borel 1930, Les Moustiques, 248 (♂*, ♀, L*); Barraud 1934, Fauna Brit. India 5: 185 (♂*, ♀*, L*); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 636 (♂*, ♀, L).

FEMALE. *Head.* Torus with dark scaling mesally; palpus broadly white tipped; proboscis ventrally with extensive pale scaling, this pale scaling produced onto lateral and dorsal aspect in area of middle as a wide band, dorsal midline may be dark or band may be complete, exact amount of pale scaling on proboscis subject to considerable variation; vertex with upright forked scales dark. *Thorax.* (Figure 1.) Anterior pronotum with white scales which are mostly broad; posterior pronotum with many broad white scales posteriorly, there may also be some present anteriorly and sometimes there are pale narrow scales dorsally; scutum with pale scaling yellow to whitish-yellow, median scutal line forked at prescutellar space, submedian line broken at level of scutal angle with its posterior portion bent briefly antero-laterally along scutal angle, usually not closely approaching lateral scutal margin; pleuron with prealar scale patch continuous with upper sternopleural patch and no scales on paratergite or subspiracular area. *Legs.* (Figure 2.) Fore femur anteriorly dark, a pale-scaled edging ventrally; mid femur with pale scales along anterior midline; hind femur with anterior submedial pale area not crossing dorsal surface, apico-ventral pale area extensively produced onto anterior surface but not ringing femoral apex; fore and mid tarsi with distinct basal white bands on I-II, less distinct basal pale scaling usually present on III of mid tarsus; hind tarsus with prominent white basal bands on I-III, that on III dorsally occupying approximately half of segment. *Abdomen.* Terga dorsally dark scaled, with narrow medio-basal yellowish area or basal bands of white scales usually present on some segments (absent on type of *chrysolineatus*), baso-lateral silvery white spots usually visible dorsally on more terminal segments. *Variation.* According to Barraud (1934: 188), Malayan specimens differ from those from India and Ceylon in having few or no white scales on anterior surfaces of fore and mid femora, and apparently no basal bands on

abdominal terga in female. In scaling of proboscis, posterior pronotum, etc., they are closely similar to Indian specimens.

MALE. *Head.* Palpus with pale scaling at joints of III-IV and IV-V, remaining portions dark scaled; proboscis dark scaled except for a distinct white band just beyond middle, additional pale scaling variably present ventrally. *Thorax.* Posterior pronotum with fewer broad scales than in female. *Legs.* No pale basal scales on III of fore tarsus. *Abdomen.* Terga with dorso-basal pale scaling highly variable, usually more developed than in female. *Terminalia.* (Figure 3.) Tergal lobes of IX each with approximately 14-34 setae; basimere with a slightly-defined basal tergo-mesal lobe, bearing 7-28 slender setae.

PUPA. Chaetotaxy similar to *saxicola* (Figure 11).

LARVA. (Figure 3.) *Head.* Hairs 5, 6-C with 4-6 branches; 14-C with 2-3 branches; basal maxillary hair (bmh) with 3-4 branches. *Thorax.* Without obvious pilosity; hair 1-P with 2-3 branches; 3-P with 4-6; 8-P with 4-6; 14-P with 2-3; 1-M with 3-4; 1-T with 3-5; 5-T with 1-2; 7-T with 4-6, similar in shape and development to hair 6-M. *Abdomen.* Pilosity, if present, small and not uniformly distributed; hair 1-III-VII with 2-4 branches; comb consisting of 22-27 scales, each scale short, sharply tapered to a stout central spine, with lateral fringe of short spicules (none of which attains apex of central spine); siphon non-pilose, pale, index approximately 2.2-2.5; siphon hair tuft with tips usually reaching or slightly exceeding siphon apex; pecten with 13-19 teeth, with 2-4 distinct ventral denticles, last 1-2 teeth usually inserted on a level with or just beyond siphon hair tuft, terminal tooth may be simple or with denticles; hair 1-X stout, barbed, single, considerably longer than saddle; ventral brush without precratal tufts. *Variation.* This description, which has been prepared from Thailand specimens only, matches all details given for the larva of *chrysolineatus* by Barraud (1934: 187; presumably based upon Indian specimens) except that he describes hair 1-X as being 3-4 branched and only a little longer than the saddle. Viet Nam material as described by Borel (1928, 1930) resembles that from Thailand in having this hair single.

TYPE DATA. *Hulecoeteomyia trilineata* Leicester, cotype male and female in British Museum, male terminalia mounted; type locality: Kuala Lumpur (Leicester), MALAYSIA. *Howardina chrysolineata* Theobald, holotype female in British Museum; type locality: Pundabroya (= Pundaluoya; Green), CEYLON. *Culex japonicus* var. *ceylonica* Theobald, 1 cotype female in British Museum, location of second cotype unknown; type locality: Peradeniya (Green), CEYLON.

DISTRIBUTION. Specimens examined: INDIA, Bombay, Nagargali and Deccan, 3 males, 3 females. THAILAND, Chiang Mai, Chumphon, Ranong, and Nan, 25 males, 11 females, 2 pupae, 39 larvae, 10 rearings. VIET NAM, Quan Loi, 6 larvae. Records from literature: INDIA, Bombay, Malabar, Eastern Himalayas. CEYLON (Barraud, 1934). THAILAND, Patalung Pass (Causey 1937). MALAYSIA, Bukit Kutu and Ulu Gombak, nr. Kuala Lumpur (Leicester 1908). JAVA, Ngledok (Brug 1931), Tosari (Theobald 1911). VIET NAM (as Cochinchina, Borel 1928). SUMATRA (Brug and Bonne-Wepster 1947).

TAXONOMIC DISCUSSION. Because of the variation in type and extent of adult markings which occurs in this species, it is frequently difficult to separate from *harveyi*, which is not only very similar morphologically but also on occasion occurs in the same larval habitat. Fortunately, the larvae are sharply distinct on the structure of the comb scales and pecten teeth. Accordingly, on the basis of a recently-acquired series of reared adult-associated larval and pupal skins from Thailand, it is now possible to describe the range of adult variation for the 2 species with some measure of confidence. It is likely that the Thailand material will eventually prove to be a species other than *chrysolineatus* for Barraud (1934:185) describes Indian larvae as having hair 1-X with 3-4 branches, whereas it is uniformly single in larvae from Viet Nam (Borel 1928, 1930) and from Thailand. This is a character of specific rank in the *chrysolineatus* subgroup. Adult-associated rearings from India will be required for the solution of this problem.

BIOLOGY. The larva has been reported from tree holes (Barraud 1923), from rock holes in a mountain stream (Causey 1937), from bamboo (Leicester 1908; Barraud 1924), from *Colocasia* leaf axils (Brug 1931), and from roof gutters and broken chatti (Barraud 1934). The Thailand specimens (USNM) newly reported here were reared from the following habitats: fallen leaf, banana tree leaf axil, rock pool, root hole, bamboo stump, bamboo internode, tree hole, and a clay pot. The Viet Nam specimens were from rubber cups. Leicester (1908) and Macdonald (1957) recorded the adult as being a sylvan biter of man.

Aedes (Finlaya) formosensis Yamada
(Figures 1, 2, 4)

Aedes formosensis Yamada 1921, Annot. zool. jap. 10:67 (♀).

Aedes (Finlaya) pallirostris Edwards 1922, Indian J. med. Res. 10: 270 (♀); Barraud 1934, Fauna Brit. India 5: 190 (♀); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 640 (♀). **NEW SYNONYMY.**

Aedes formosaensis Yamada, Edwards 1922, Indian J. med. Res. 10: 262 (lapsus).

Finlaya khasiana Barraud 1923, Bull. ent. Res. 13: 407 (♂, ♀); Edwards 1932, in Wytsman, Genera Insect. fasc. 194: 151 (synonymy).

FEMALE. *Head.* Torus with dark scales mesally; palpus broadly white tipped, sometimes a few pale scales at apex of penultimate segment; proboscis pale scaled beneath in middle third, the pale scaling visible from lateral aspect, not usually visible from above ("*khasiana*" form); exact extent of pale scaling subject to much variation, in some specimens pale scaling encroaches onto dorsal surface and may on occasion even cover all but midline of basal four-fifths of proboscis ("*pallirostris*" form); vertex with medial upright forked scales dark. *Thorax.* Anterior pronotum with broad white scales; posterior pronotum with narrow curved yellowish or whitish scales, at least some broad pale scales ventro-posteriorly; scutum

(Figure 1) with median line forked at prescutellar space; submedian line strongly developed, broken at level of scutal angle with its posterior portion bent antero-laterally along scutal angle to lateral margin; line over wing base anteriorly closing or nearly so at scutal angle with outcurved portion of submedian line; pleuron (Figure 2) with scales noticeably broad in comparison with most of the species of this subgroup; prealar scale patch distinctly separate from upper sternopleural scale patch; paratergite with a line of broad white scales, mostly borne on lower surface; subspiracular area often with a small group of broad white scales. *Legs.* Fore femur anteriorly dark, a pale-scaled line along ventral border and a small poorly defined creamy area dorsally at apex; mid femur usually with scattered (may be continuous) pale scaling along part or all of longitudinal midline anteriorly, usually a small white spot dorsally just before apex; hind femur with apico-ventral pale area extensively produced onto anterior surface and usually encircling apex; tibiae each with very pronounced basal white area anteriorly and a thin white basal ring; fore and mid tarsi with distinct basal white bands on tarsomeres I and II, less distinct basal pale scaling usually present on mid tarsomere III; hind tarsus with prominent white basal bands on tarsomeres I-III, that on III dorsally occupying approximately half of segment. *Abdomen.* Terga dorsally dark scaled, narrow medio-basal areas of pale scales (usually of an obscure yellowish-white color but may be bright white) present on some segments (usually III-VI), basolateral silvery-white spots usually visible dorsally on more terminal segments. *Variation.* A female from Sumatra has the proboscis so dark scaled that it was first believed to go into that portion of the adult key. However, careful examination showed the proboscis to have a small ventral area, just beyond the middle, of pale brownish scales.

MALE. *Head.* Palpus with basal pale scaling ventrally and laterally on IV and V, a prominent basal white band laterally and dorsally on III; proboscis with a narrow area of pale scales ventrally and laterally at joint, may be visible dorsally, additional pale scaling may variably occur along ventral surface. *Abdomen.* Terga with basal white bands on III-VII, these may be disconnected laterally from baso-lateral silvery-white spots on 1 or more segments, II may have medio-basal pale scales. *Terminalia.* (Figure 4.) Tergal lobes of IX each with approximately 4-13 setae; claspette filament not noticeably wider at any particular point, tapering to apex from about middle. *Variation.* A male (USNM: CM-148) from Thailand has the proboscis completely dark scaled. This character is of specific rank in this subgroup, but it never applies quite as well to the male as to the female. Its significance in this particular case is not known.

PUPA. Chaetotaxy similar to *saxicola* (Figure 11).

LARVA. (Figure 4.) *Head.* Hair 5-C with 9-22 branches; 6-C with 5-9; 14-C and basal maxillary hair (bmh) stiff, single, rarely double. *Thorax.* Without obvious pilosity; hair 1-P with 2-7 branches; 3-P with 8-15; 8-P with 3-6; 14-P with 2-3; 1-M well developed, with 4-8 branches; 1-T with 2-6 branches; 5-T stiff, single; 7-T with 4-12, similar in form and less prominently developed than hair 6-M. *Abdomen.* Pilosity, if present, very small and not uniformly distributed; hair 1-III-VII with 2-7 branches; comb

consisting of 29-51 scales, each with fine lateral spicules basally and coarser spicules along remainder of length, usually 1 apical spicule much more strongly developed; siphon non-pilose, blackish-brown, index approximately 1.5-2.0; siphon hair tuft with tips not attaining siphon apex; pecten with 8-13 teeth, each tooth with 1-2 ventral denticles along basal half, may be 1-3 non-dentate teeth with point of attachment even with or beyond insertion of siphon hair tuft; hair 1-X stout, barbed, single, length about 1.5 times length of saddle; ventral brush with 1-2 precratal tufts.

TYPE DATA. *Aedes formosensis* Yamada, female lectotype (selected by M. Delfinado, VIII-1966) in Medical Zoology Laboratory, Institute for Infectious Diseases, University of Tokyo; type locality: Kakubanzan (given as "Kappanzan, Formosa" on label; Hirayama), TAIWAN. *Aedes pallirostris* Edwards, female holotype in British Museum; Golaghat, Sibsagar dist., Assam (Christophers), INDIA. *Finlaya khasiana* Barraud, male and female cotypes in British Museum; type locality: Shillong, Khasi Hills, Assam (Barraud), INDIA.

DISTRIBUTION. Specimens examined: MALAYSIA, 4 females. THAILAND, Chiang Mai, Narathiwat, Khaoyai, Pakchong, Nan, Nakhon Si Thammarat, 32 males, 77 females, 52 larvae, 26 rearings. SUMATRA, Ranau-See, 1 male, 2 females. JAVA, Tjisaroea, Patjat, Ngledok, Tjisanaea, 1 male, 6 females. BALI, Batoeriti, 1 female. Records from literature: TAIWAN (Yamada 1921, Lien 1962). INDIA, Assam, E. Himalayas (Barraud 1934). ?SUMATRA. ?BALI (Edwards, in Barraud 1934). CHINA, Western Yunnan (Chow 1949). MALAYSIA, Ulu Langat, Ulu Gombak, Kepong (Selangor) (Macdonald 1957).

TAXONOMIC DISCUSSION. Based upon an examination of the type of *formosensis* by M. Delfinado (August, 1966), *pallirostris* is here synonymized to that species. Edwards (in Barraud 1934) earlier suggested that *pallirostris* might in fact be just a variation of *formosensis*, but an examination of the type of the latter was required to confirm this.

Most of the specimens included here represent the form previously treated by Knight (1947) as *formosensis* because they are similar to the type of *khasiana* in having little or no pale scaling dorsally on the proboscis. Specimens with distinct dorsal pale scaling on the proboscis were considered to be *pallirostris* because its type is similarly marked.

A long series of specimens from Thailand have recently become available, some with associated larval and pupal skins. From an examination of these specimens, it is now apparent that the extent of the pale scaling of the proboscis is subject to much variation, and that both extremes can be found associated with a single larval type.

A. formosensis is unique in the *chrysolineatus* subgroup in possessing scales on the paratergite of the adult, and in having larval head hair 5-C virtually plumose (with 9-22 branches).

BIOLOGY. In Thailand, this species was a frequent component of daytime biting catches, primarily in the forest, but occasionally also in the open. The larvae were collected commonly in the leaf axils of *Colocasia* and of banana trees. One collection was from a bamboo stump. Lien (1962)

reported that in Taiwan the larvae of this species were found almost exclusively in leaf axils of *Musa* and more rarely in *Colocasia*.

Aedes (*Finlaya*) *harveyi* (BARRAUD)
(Figure 5)

Finlaya harveyi Barraud 1923, Bull. ent. Res. 13: 407 (♂, ♀).

Aedes (*Finlaya*) *harveyi* (Barraud), Barraud 1934, Fauna Brit. India 5: 188 (♂, ♀); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 638 (♂, ♀).

Aedes (*Finlaya*) *formosensis* Yamada, Chow 1950, Quart. J. Taiwan Mus. 3: 282 (misidentification); Lien 1962, Pacif. Ins. 4: 622 (in part).

FEMALE. *Head.* Torus with dark scaling mesally; palpus white tipped; proboscis with pale scaling beneath from near base to shortly beyond middle, dark laterally and dorsally, actual extent of ventral pale scaling variable, may even be some extension onto lateral surface; vertex with upright forked scales dark. *Thorax.* Anterior pronotum with white scales, mostly broad; posterior pronotum with narrow whitish or yellowish scales above, a small patch of broad white scales ventro-posteriorly; scutal pale scaling golden, median scutal line forked posteriorly at prescutellar space, submedian line broken at level of scutal angle with its posterior portion bent antero-laterally along scutal angle, laterally connecting or nearly so with anterior portion of lateral line; prealar scale patch usually continuous with upper sternopleural scale patch, sometimes showing evidence of separation, occasionally completely separated, no scales on paratergite or subspiracular area. *Legs.* Fore femur anteriorly dark, marked with a pale scaled line ventrally along basal half; mid femur with anterior surface usually dark; hind femur with anterior submedial pale area not extending onto dorsal surface, apico-ventral white area broadly produced onto anterior surface but not quite ringing apex; fore and mid tarsi with distinct basal white areas on I-II, less distinct basal pale scaling usually present on middle tarsal III; hind tarsus with prominent white basal bands on I-III, that on III dorsally occupying slightly more than half of segment. *Abdomen.* Terga without dorsal markings, baso-lateral silvery spots usually visible dorsally on more terminal segments, occasionally a few baso-medial yellowish scales occur on some terga.

MALE. *Head.* Palpus with basal pale scaling ventrally and laterally at joints of III-IV and IV-V; proboscis with a narrow area of pale scales ventrally and laterally at joint, may extend very narrowly onto dorsal surface. *Abdomen.* At least some terga, usually III-VI, with pale basal bands. *Terminalia.* (Figure 5.) Tergal lobes of IX each with approximately 13-26 setae; basimere with a slightly-defined basal tergo-mesal lobe, bearing 7-15 slender setae; claspette filament may be slightly enlarged in area of middle, the taper beginning at or just beyond middle.

PUPA. Chaetotaxy similar to *saxicola* (Figure 11).

LARVA. (Figure 5.) *Head.* Hairs 5, 6-C with 4-7 branches; 14-C and basal maxillary hair (bmh) well developed, former with 1-4 (usually 1-2),

latter with 3-5. *Thorax*. Without obvious pilosity; hair 1-P with 2-4 branches; 3-P with 2-6; 8-P with 4-9; 14-P with 2-3; 1-M well developed, with 3-6 stiff stubby branches; 1-T with 3-6 branches; 5-T with 1-2; 7-T with 3-9, similar in shape and development to 6-M. *Abdomen*. Pilosity if present very small and not uniformly distributed; hair 1-III-VII with 1-3 branches; comb consisting of 26-46 scales, each scale slightly expanded apically and with an even lateral and apical fringe of spicules; siphon non-pilose, index approximately 2.4-2.7; siphon hair tuft with tips usually reaching or slightly exceeding siphon apex; pecten with 12-21 teeth, with 1-4 ventral denticles on basal half of all except terminal 1-2 teeth (rarely none without denticles), last tooth usually inserted just before base of siphon hair tuft, occasionally 1 non-dentate tooth with point of attachment beyond insertion of siphon hair tuft; hair 1-X stout, barbed, considerably longer than saddle, single (occasionally seen sub-basally divided); ventral brush without precra-tal tufts.

TYPE DATA. Male and female cotypes in British Museum; type locality: Kurseong, Darjeeling district, Eastern Himalayas (Barraud), INDIA.

DISTRIBUTION. Specimens examined: VIET NAM, Dalat, 2 males, 3 females, 3 rearings. MALAYSIA, Selangor, 3 males, 5 females, 7 rearings. INDIA, Kurseong, Eastern Himalayas, 1 male, 1 female. THAILAND, Chiang Mai, Nakhon Nayok, Nakhon Si Thammarat, Chanthaburi, 23 males, 42 females, 153 larvae, 51 rearings. TAIWAN, 4 females. SUMATRA, Tjoeroep, 1 male. Records from literature: INDIA, Eastern Himalayas, Madras, South India (Barraud 1934). SUMATRA, Lake Banau, 700 m., Boekit Daoen (Brug and Edwards 1931). ?JAVA, Ngadisari and Tjibodas. ?BALI, Batoeriti and Kintamani (Brug 1931). CEYLON (Carter and Wijesundara 1948). MALAYSIA (Macdonald 1957). CHINA, Western Yunnan (Chow 1949).

TAXONOMIC DISCUSSION. The adult of *harveyi* is so similar to *chrysolineatus* that the 2 species are frequently difficult to separate in that stage. Although the types had been seen earlier, the concept of *harveyi* used here was not established until adult-associated larval skins from Thailand and Malaysia were studied. Based upon adult-associated larval skins of both species, it is now possible to say that they are quite distinct on the basis of larval comb and pecten tooth structure. Just as with *chrysolineatus*, the possibility exists that, when adult-associated larvae are seen from India, they will prove to be different from those from Thailand and Malaysia, thereby making the latter an unnamed species.

The larva of *harveyi* was previously described by Brug (1931) from a series of larvae and adult-associated larval skins collected in Sumatra, Java, and Bali. As described by him, the Indonesian larva differs markedly from the Malaysian and Thailand material described above, as follows: head hair 5-C figured with 9 branches; comb scales of 2 types with posterior scales illustrated as being sharply tapered apically, and pecten shown to have 2 strong teeth well distad of the insertion of the siphon hair tuft. I have not seen any of Brug's specimens so cannot accurately determine what

species he had. This larva will go to the *harveyi-chrysolineatus* couplet in the larval key of this paper, but is distinct from either of these in having apical pecten teeth and 2 types of comb scales.

Edwards (in Barraud 1934:190) subsequently saw 2 of Brug's isolations (from Bali) and pronounced them *formosensis*. His description of these 2 larvae does indeed sound like *formosensis*. However, the larva figured by Brug (1931) does not match my concept of *formosensis* since the siphon hair tuft reaches the siphon apex.

The identity of these various specimens will remain in doubt until adequate series of adult-associated larvae are available from Indonesia and India.

Four female specimens from Taiwan have been seen in the USNM collection which are probably *harveyi*. In each case they were reared from bamboo stumps. Lien (1962) says that although Chow (1950) recorded *formosensis* from bamboo stumps, he had not been able to collect it from this habitat; rather all specimens resulting from larvae collected from bamboo stumps were another species in the *chrysolineatus* group, which he planned to discuss in a separate paper. I have not yet seen that paper but I think it likely that his species from bamboo and *harveyi* are one and the same.

BIOLOGY. Because of the uncertainties existing in the identification of this species, the larval habitats recorded by Brug (1931) are not given here. In Thailand, larvae which I have examined were collected from the following habitats: cavity on top of a log, in a clay pot, tree hole, bamboo stump, fallen leaf, rock pool, coconut shell, bamboo internode, and tin container. On at least 1 occasion, an adult was taken in a biting collection in heavy forest and a male was found resting in a hut. The type series was collected from tree holes.

Aedes (Finlaya) japonicus japonicus (Theobald)
(Figure 6)

Culex japonicus Theobald 1901, Mon. Cul. 1: 385 (♀).

Aedes (Finlaya) eucleptes Dyar 1921, Insec. Inscit. menst. 9: 147 (♂, ♀);
Edwards 1922, Indian J. med. Res. 10: 465 (synonymy).

Aedes (Finlaya) japonicus (Theobald), Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 631 (♂, ♀, L*); LaCasse and Yamaguti 1950, Mosq. Fauna Japan and Korea, 151 (♂*, ♀*, P*, L*).

FEMALE. *Head.* Torus with mesal aspect bearing both dark and pale broadened scales; palpus dark scaled; proboscis dark scaled; vertex with upright forked scales dark, sometimes a few pale ones medially.

Thorax. Anterior pronotum with an oblique band of broad white scales; posterior pronotal scaling white, yellowish, or mixed, considerable variation exists in the arrangement, amount, extent, and precise shape of the scales; scutum with golden scales longer than brown scales, having a roughened or untidy appearance; median scutal line broad, sometimes tending to appear double, forked posteriorly at prescutellar bare space; submedian line broken

at level of scutal angle with anterior end of posterior portion bent laterally along scutal angle, sometimes extending as far as lateral margin of scutum at anterior end of lateral line, posterior end of anterior portion of submedian line bent slightly mesad so as to pass briefly inside of posterior portion; a broad diffused pale scaled area laterally over wing base; in some specimens part or all of scutal lines become obliterated by diffused golden scaling; pleuron with prealar and upper sternopleural scale patches separated and no scales on paratergite or subspiracular area. *Legs.* Fore femur dark anteriorly, sometimes a baso-ventral line of white scaling; mid femur dark anteriorly except for a dorsal white area almost at apex (there is an apical fringe of dark scales), some pale scales may occur along longitudinal midline; hind femur with the median anterior white area occasionally continuous, at least narrowly, to base, the basal extent of this marking apparently subject to much variation; apical pale area forming a complete ring almost at apex (an apical fringe of dark scales is present); fore tarsus with basal white scaling on I-II; mid tarsus with distinct basal white bands on I-II; hind tarsus with prominent basal white bands on I-III, that on III occupying slightly less than half of the segment. *Abdomen.* Terga dorsally dark scaled; baso-lateral silvery-white spots usually visible dorsally on VII-VIII, sometimes also on IV-VI; may be a few medio-basal pale scales on some segments.

MALE. *Head.* Palpus dark scaled; proboscis dark scaled. *Thorax.* Scutum with golden markings even more diffused and roughened than in female. *Abdomen.* Terga dorsally dark scaled, with a baso-medial spot of pale scales on III-VI, may be reduced to just a few scales on some segments, baso-medial spots may occasionally form narrow basal bands by connecting laterally with baso-lateral spots. *Terminalia.* (Figure 6.) Tergal lobes of IX each with approximately 4-7 setae; tergo-mesal margin of basimere medially with 1 seta noticeably more strongly developed than the others, and in this respect differing from other members of the subgroup; claspette filament evenly tapered.

PUPA. No specimens available.

LARVA. (Figure 6.) *Head.* Hairs 5, 6-C with 3-6 branches; 14-C and basal maxillary hair (bmh) stiff, single or rarely double. *Thorax.* Without obvious pilosity; hair 1-P with 2-3 branches; 3-P with 2-5; 8-P with 1-4; 14-P with 2; 1-M with 1-5; 1-T small, with 2-4 branches; 5-T single; 7-T with 4-7, similar in shape and development to 6-M. *Abdomen.* Pilosity, if present, very small and not uniformly distributed; hair 1-III-VII with 1-3 branches; comb consisting of about 38-74 scales; each tooth slightly enlarged apically and bearing a rather even lateral and apical fringe; siphon non-pilose, index approximately 3.0-3.5; siphon hair tuft with tips not attaining siphon apex; pecten with 15-27 teeth, with 1-5 ventral denticles along basal half of each tooth, usually 1-4 irregularly spaced non-denticulate teeth beyond base of siphon hair tuft; hair 1-X 1.0-1.5 times length of saddle, not heavily barbed, single; ventral brush with 1-2 precratal tufts.

TYPE DATA. *Culex japonicus* Theobald, 2 female cotypes in British Museum; type locality: Tokyo (Woods), JAPAN. *Aedes eucleptes* Dyar, male holotype in U. S. National Museum, terminalia mounted; type locality: Canton (Howard), CHINA.

DISTRIBUTION. Specimens examined: JAPAN, Honshu, Kyushu, 17 males, 16 females, 35 larvae. CHINA, Foochow, 2 males, 2 females, 10 larvae. HONG KONG, 1 larva. Records from literature: JAPAN, Honshu, Shikoku, Kyushu (Yamada 1927); Hokkaido (LaCasse and Yamaguti 1950). CHINA, Anhwei, Chekiang, Fukien, Kiangsi, Kwangtung (Feng 1938). SOVIET FAR EAST (Chagin and Kondratiev 1943).

TAXONOMIC DISCUSSION. This species has been commonly confused with *koreicus*. However, it is well distinct from it on adult and larval characters. The Taiwan material formerly attributed to this species is now being considered under the subspecies, *japonicus shintienensis* Tsai and Lien, as is also the southern Ryukyus material of Bohart (1959).

BIOLOGY. The larva has been reported from a variety of container habitats, including granite cemetery basins, stream rock holes, cement tanks, bamboo stumps, tree holes, and artificial containers near homes. The larva is occasionally collected from ground pools. The female bites humans but only uncommonly.

According to Yamada (1927), *japonicus* is not a suitable intermediate host of *W. bancrofti*. It has been reported as a vector of Japanese encephalitis in the Soviet Far East by Chagin and Kondratiev (1943).

Aedes (Finlaya) japonicus shintienensis TSAI AND LIEN
(Figures 1, 2, 7)

Aedes (Finlaya) shintienensis Tsai and Lien 1950, J. med. Ass. Formosa 49: 177 (♂*, ♀*, P*, L*).

Aedes (Finlaya) japonicus shintienensis Tsai and Lien, Lien 1962, Pacif. Ins. 4: 623.

FEMALE. *Head*. Torus with mesal aspect bearing both dark and pale broadened scales; palpus dark scaled; proboscis dark scaled; vertex with broad medial area of pale upright forked scales. *Thorax*. Anterior pronotum with narrowed yellowish-white scales above, broad white scales below; posterior pronotum with narrow-curved yellowish-white scales anteriorly, dorsally, and posteriorly, a small patch of broad whitish scales ventro-posteriorly; scutum (Figure 1) with golden scales appearing longer and more shaggily arranged than the brown scales; median scutal line broad, somewhat double in appearance, forked posteriorly at prescutellar bare space; submedian line broken at level of scutal angle, anterior portion mesally out of line with posterior portion, anterior end of posterior portion bent laterally along scutal angle and vaguely connecting with anterior end of lateral line; area between submedian and lateral lines with diffused golden scaling; prealar and upper sternopleural scale patches separate; no scales on paratergite or subspiracular area. *Legs*. Fore femur dark anteriorly, sometimes a baso-ventral line of pale scaling; mid femur dark anteriorly except for a small basal white area, a dorso-subapical white area (a single ring of apical black scales), and usually some pale scales along longitudinal midline (Figure 2); hind femur with broad anterior white area extending from

near base to beyond middle, apical pale area forming a complete ring (in Figure 2, however, an apical fringe of dark scales is present); tibiae dorsally and anteriorly dark; fore and mid tarsi with narrow basal white bands on I-II; hind tarsus with prominent basal white bands on I-III. *Abdomen*. Terga dorsally dark, baso-lateral silvery-white spots visible dorsally on more terminal segments.

MALE. *Head*. Palpus dark scaled; proboscis dark scaled. *Thorax*. In some specimens, scutum has diffused golden scales overall with an obliteration of linear pattern. *Abdomen*. Terga dorsally dark scaled, with a baso-medial spot of pale scales on III-VI, these spots may be reduced to just a few scales on some segments, or even absent. *Terminalia*. Tergal lobes of IX each with approximately 5-6 setae; tergo-mesal margin of basimere with 5-6 setae more strongly developed than those adjacent; claspette filament slightly enlarged just before middle.

PUPA. No specimens available (figured but not described in type description).

LARVA. (Figure 7.) No adequately preserved larvae from Taiwan were available. However, from the type description the larva does not appear to differ from that of *j. japonicus*. The ventral brush is described as having only 9 tufts, whereas in *j. japonicus* it has 11-12 tufts. However, this difference is possibly due to an error in observation. Two larvae from Iriomote in the Ryukyu Islands (USNM) did not show any noticeable differences from Japanese larvae of *j. japonicus* except that in the former the last 1-2 pecten teeth were slightly out of line ventrally. One of these specimens has been figured.

TYPE DATA. Cotype male and female presumed to be in Inst. Trop. Med., National Taiwan University, Taipeh, Taiwan; type locality: Chüchih, Shintien, Taipeh (Lien), TAIWAN.

DISTRIBUTION. Specimens examined: TAIWAN, 2 males, 12 females, 6 larvae. RYUKYU ISLANDS, Iriomote Island, Ishigaki Island, 1 male, 1 female, 2 larvae. Records from literature: TAIWAN (Tsai and Lien 1950).

TAXONOMIC DISCUSSION. This form differs from the type species in having a large median area of pale upright forked scales on the vertex in the female, in having narrow-curved yellowish-white scales dorsally on the anterior pronotum, and in the absence of a single enlarged seta medially on the tergo-mesal margin of the basimere. Specimens from Japan, apparently *j. japonicus*, normally have the upright forked scales dark but specimens have been seen from Kyushu which had a few of the median upright forked scales pale.

BIOLOGY. Tsai and Lien (1962) report that the larva of this form is common throughout Taiwan in rock holes in stream beds, depressions on fallen trees, and artificial containers in mountainous areas below 2400 meters. The live larva has a dark brown head and reddish brown thorax and abdomen. The habits of the adult are not known.

Aedes (Finlaya) jugraensis (LEICESTER)
(Figures 1, 2, 8)

Hulecoeteomyia jugraensis Leicester 1908, Cul. Malaya : 109 (♂, ♀).

Aedes (Finlaya) jugraensis Leicester, Edwards 1922, Indian J. med. Res. 10: 466; Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 647 (♂, ♀, L); Knight and Hull 1951, Pacif. Sci. 5: 242 (L*).

FEMALE. *Head.* Torus with dark scales mesally; palpus apically white scaled; proboscis dark scaled; vertex with upright forked scales dark. *Thorax.* Anterior pronotum with broad creamy scales; posterior pronotum with a dorsal semicircle of yellowish scaling, narrow curved except for a small posterior area of broadened scales; median scutal line (Figure 1) extends posteriorly unforked nearly or completely across prescutellar area; submedian line broken at level of scutal angle, sometimes with its posterior portion bent briefly antero-laterally along the angle; line over wing base anteriorly not connecting at scutal angle with outcurved portion of submedian line; prealar scale patch (Figure 2) confluent with upper sternopleural scale patch; no scales on paratergite or subspiracular area. *Legs.* Fore and mid femur anteriorly dark scaled, a baso-ventral line of white scaling on fore femur; hind femur with ventro-apical white scaled area extending onto both anterior and posterior surfaces and narrowly ringing apex (Figure 2); fore and mid tarsi with narrow basal white rings on I-II, hind tarsus with broad basal bands on I-III, that on III occupying the basal 0.4-0.5 of the segment. *Abdomen.* Terga I-VII dark dorsally, baso-lateral white spot visible dorsally on IV-VI and extending prominently onto dorsum of VII, VIII with a complete basal band. *Variation.* A female specimen from Tjisaroea, Java (BM), with abdomen missing, matches this species except that it has the prealar and upper sternopleural scale patches widely separated. In this respect, it resembles *A. rizali*, differing from it only in having the posterior portion of the submedian scutal line not bent antero-laterally along the scutal angle. The distribution is, of course, far removed from the presently known range of *A. rizali*.

MALE. *Head.* Palpus dark scaled, terminal segment entirely white beneath; proboscis dark scaled. *Abdomen.* Terga IV-VI with basal white bands, medio-basal white spot on III, baso-lateral silvery spots on VII-VIII extend onto dorsal surface. *Terminalia.* Tergal lobes of IX each with approximately 6-10 setae, basimere with a distinctive band of short curved setae along basal meso-tergal area; claspette filament also distinctively shaped, not sickle-shaped but blade-like with widest point at about 0.75 from base (Figure 8).

PUPA. No specimens available.

LARVA. (Figure 8.) *Head.* Hairs 5, 6-C with 3-4 branches; 14-C with 1-2; basal maxillary hair (bmh) with 4-8. *Thorax.* Without obvious pilosity; hairs 1, 3-P with 3-4 branches; 8-P stellate, with 5-8; 14-P with 2; 1-M dark, spine-like, single; 1-T with 2-3; 5-T stiff, single; 7-T with 3-4 branches, each short, very stout, darkly pigmented, and barbed, very unlike 6-M in shape and development. *Abdomen.* Without noticeable pilosity; hair

1-III-VII with 2-4 branches; comb with about 14-19 large scales, each scale with a lateral fringe of evenly-developed spicules and a stout apical spine or prolongation; siphon non-pilose, index approximately 2.4; siphon hair tuft with tips exceeding siphon apex; pecten with about 10-16 teeth, each tooth with 1 well developed ventral denticle before middle and sometimes a second smaller one basally, no teeth inserted beyond base of siphon hair tuft; hair 1-X single, nearly twice length of saddle; ventral brush without precratal tufts.

TYPE DATA. Male and female cotypes, non-existent; type locality: Jugra (Leicester), MALAYSIA.

DISTRIBUTION. Specimens examined: PHILIPPINES, Balabac Island, 2 larvae. MALAYSIA, Perak and SINGAPORE, 1 male, 3 females, 1 larva. N. BORNEO, Tawau, 1 male. JAVA, Tjisaroea, 1 female. Records from literature: MALAYSIA, ?PHILIPPINES (Macdonald 1957).

TAXONOMIC DISCUSSION. Based upon the larva, this species is closely related to *saxicola*, differing principally from that species on the characters used in the keys. The male is distinct from all other species in the subgroup on the location of the palpal pale scaling, the shape of the claspette filament, and the setation of the basal tergo-mesal area of the basimere.

BIOLOGY. Macdonald and Traub (1960) reported this to be the most common member of the *chrysolineatus* subgroup in Malaysia. Nearly half of their collections came from fallen split bamboos. Occasional collections of larvae were also made from bamboo stumps, bamboo sections with holes, and tree holes, but the most important secondary source of larvae was fallen leaves. They have also been found in rock pools and in tin cans. The adults were collected from human bait (Macdonald 1957). ○

Aedes (Finlaya) nigrorhynchus BRUG

Aedes (Finlaya) harveyi var. *nigrorhynchus* Brug 1931, Arch. Hydrob. Suppl. bd. 9: 28 (♂, ♀, L*); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 636 (taxonomy). NEW STATUS.

FEMALE. *Head*. Torus with dark scales mesally; palpus white tipped, sometimes a few pale scales at apex of penultimate segment also; proboscis all dark scaled; upright forked scales of vertex dark. *Thorax*. Anterior pronotum with broad white scales; posterior pronotum with narrow and narrow-curved pale scales dorsally and posteriorly, a few broadened pale scales ventro-posteriorly; scutal pale scaling golden; median scutal line forked posteriorly at prescutellar space; submedian line broken at level of scutal angle with its posterior portion bent antero-laterally along scutal angle, connecting laterally with anterior portion of lateral line; prealar scale patch distinctly separate from upper sternopleural scale patch; paratergite and subspiracular area without scales. *Legs*. Fore femur anteriorly dark, marked with a pale-scaled line ventrally along basal half; mid femur with anterior surface dark; hind femur dark dorsally, apico-ventral white area

extensively produced onto anterior surface; fore and mid tarsi with distinct basal white bands on I-II; hind tarsus with prominent basal white bands on I-III, that on III dorsally occupying slightly more than half of segment.

Abdomen. Terga dorsally dark scaled, baso-lateral silvery spots usually visible dorsally on VII-VIII.

MALE. *Head.* Palpus with basal pale scaling ventrally and laterally on IV and V; proboscis with a narrow area of pale scales ventrally and laterally at joint which may extend onto dorsal surface. *Abdomen.* At least some terga with narrow pale basal bands. *Terminalia.* Tergal lobes of IX each with approximately 13-17 setae; basimere with a slightly-defined basal tergomal lobe, bearing a number of slender setae; claspette filament not noticeably wider at any particular point, tapering to apex from before middle.

PUPA. No specimens available.

LARVA. Not seen. Brug (1931) describes and figures the single larval skin associated with an adult of *nigrorhynchus* as follows: *Head.* Hairs 5, 6-C with 6 branches; 14-C stellate, with 4; basal maxillary hair stellate, with 8. *Thorax.* Hair 1-P with 3 branches; 3-P with 2. *Abdomen.* Comb scales pointed, with a short lateral fringe; pecten with last tooth simple and no teeth inserted beyond siphon hair tuft; siphon hair tuft reaching or exceeding siphon apex; saddle with 4 spines laterally on distal margin; hair 1-X considerably longer than saddle, double. Body pilosity is not mentioned or figured.

TYPE DATA. Type is non-existent; type locality: Djajasana, Preanger Regentschappen, 1,400 meters (Thienemann), JAVA.

DISTRIBUTION. Specimens examined: JAVA, Djajasana and Tangkoekan Prahoe, 3 males, 5 females. Records from literature: JAVA (Brug 1931).

TAXONOMIC DISCUSSION. Based on the discovery that both the males and females of *nigrorhynchus* differ from *harveyi* in having the prealar and upper sternopleural scale patches distinctly separated, I have here given this form the status of a full species.

Since associated larval skins have not been seen for both sexes of this species, it is still conceivable that the male and female described here as representing *nigrorhynchus* are actually not conspecific. A fuller understanding of this species will not be possible until series of adult-associated larval specimens are available.

BIOLOGY. The type collection originated from larvae collected from water in a tree hole.

Aedes (Finlaya) rizali (BANKS)
(Figures 2, 9)

Culex rizali Banks 1906, Philipp. J. Sci. 1: 999 (♀).

Aedes (Finlaya) abadsantosi Baisas 1946, Mon. Bull. Philipp. Hlth. Serv. 22(3): 25 (♂, ♀, P*, L*); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 641 (♂*, ♀, L*). NEW SYNONYMY.

Aedes (Finlaya) burgosi Baisas 1946, Mon. Bull. Philipp. Hlth. Serv. 22(3): 27 (♂, ♀, P, L*); Knight and Hull 1951, Pacif. Sci. 5: 240 (♂, L*). NEW SYNONYMY.

FEMALE. *Head.* Torus with dark scales mesally; palpus with a few pale scales apically; proboscis dark scaled; vertex with upright forked scales usually dark. *Thorax.* Anterior pronotum with a few narrowed yellowish scales above, broad creamy scales below; posterior pronotum dorsally and posteriorly with narrow yellowish scales, some of posterior scales may be broadened, occasionally a few dark scales medially; median scutal line extending across prescutellar area to near scutal border; submedian line broken at level of scutal angle, posterior portion bent antero-laterally along scutal angle to a variable extent, sometimes connecting anteriorly with lateral line; prealar scale patch distinctly separated from upper sternopleural scale patch (Figure 2); paratergite and subspiracular area not scaled. *Legs.* Fore and mid femora anteriorly dark, occasionally a few scattered pale scales present; hind femur with apico-ventral pale-scaled area not broadly expanded onto anterior aspect; fore and mid tarsi with narrow basal white rings on I-II, sometimes a few pale scales ventrally at base of III of mid legs; hind tarsus with broad basal bands on I-III, that on III occupying basal 0.4 of segment (partially broken ventrally by dark scales). *Abdomen.* Tergum I dark dorsally, II usually dark but sometimes with basal pale scaling; III-VIII with complete basal white bands, occasionally bands somewhat narrowed medially, and more occasionally even incomplete on 1 or more segments. *Variation.* In the British Museum collection there is a female specimen from the Philippines that resembles *rizali* except that the anterior portion of the postspiracular scale patch consists of narrow yellowish scales and does not extend to the ventral margin of the spiracle. All of the abdominal terga are dorsally dark except for a complete basal band on VIII. This specimen has the following data: Mt. Mupo, Dansalan (Mindanao) 28. III. 1920 (Dr. A. Moore). In the collection of the Academy of Natural Sciences of Philadelphia, there is a female specimen, Lagolago, Leyte (H. R. Roberts), with the postspiracular scales similar to those of the above specimen but differing in having the terga with complete basal bands.

MALE. *Head.* Palpus dark with white scales over joint of II-III, a latero- and ventro-basal white-scaled area on IV; proboscis dark scaled. *Abdomen.* Tergum I dark, II with medially incomplete basal band, III-VIII with complete basal bands. *Terminalia.* (Figure 9.) Tergal lobes of IX each with approximately 5-10 setae, but it should be noted that 3 of the type series of *burgosi* were described as having "more than 20-30 bristles" on each lobe. Claspette filament slightly enlarged just beyond middle.

Variation. In the USNM there is a male specimen, with associated larval and pupal skins, which cannot be separated from *rizali* except on male genital characters. The claspette blade is slender and tubular instead of being laterally flattened and there are 11-13 hairs on each of the tergal lobes of IX (San Ramon, Mindanao, 17.IX.45).

PUPA. Chaetotaxy similar to *saxicola* (Figure 11).

LARVA. (Figure 9.) Body clothed with stellate hairs and pile (variably developed). *Head.* Hairs 5, 6-C with 7-8 branches; 14-C and basal maxillary hair (bmh) stellate, with 4-7. *Thorax.* Integument heavily pilose, pile simple or branched; hair 1-P with 4-5 branches; 3-P with 5-8; 8-P stellate, with 7-11; 14-P stellate, with 3-7; 1-M stellate, with 6-10; 14-M stellate; 1-T stellate, with 10-13; 5-T stellate, with 5-9; 7-T with 5-9, similar in shape and development to 6-M. *Abdomen.* Integument heavily pilose, pile simple or branched; many stellate hairs; 1-III-VII with 2-5 branches; comb consisting of 50-72 scales, each scale broad, not appreciably tapered apically, with a conspicuous lateral and apical fringe, a medial heavier spicule sometimes apparent; siphon pilose, index approximately 2.7-3.2; siphon hair tuft with tips exceeding siphon apex; pecten with 15-20 teeth, 4-6 teeth beyond siphon hair tuft, apical 4-7 teeth simple, remainder each with 1-3 ventral denticles (may be hard to see unless siphon is strongly flattened), apical 2-5 teeth ventrally out of line with others, tip of apical tooth approximately on level with siphon apex; hair 1-X with 2 equal branches, rarely 3, longer than saddle; ventral brush without precratal tufts. *Variation.* In the type description of *burgosi*, Baisas included a small series of specimens from Mindanao (but not from the type locality). Two whole larvae from this series are in the USNM. These 2 larvae differ from one another on the basis of the shape of the comb teeth. One (R112-k; figured by Knight and Hull 1951: 241) has comb teeth with a stout central spicule, whereas the comb teeth of the other (R112-m) have a more even apical fringe. The two also differ from one another quite distinctly on the numbers of branches of various hairs. Together, these two specimens differ from both *rizali* and *sherki* because the apical pecten teeth are in line, or if anything, slightly dorsally removed (not ventrally out of line). In view of the large numbers of specimens of *rizali* and *sherki* seen by me and of the fact that none of them deviated from having the apical teeth ventrally out of line, it would seem that this could be a difference at the species level. However, present information is not sufficient to permit the reconciliation of these discrepancies.

TYPE DATA. *Culex rizali* Banks, type non-existent; type locality: Volcano Canlaon, Mt. Siya-Siya, at altitude of 760 m, Negros Occidental Province, Negros Island (Banks), PHILIPPINES. *Aedes abadsantosi* Baisas, type non-existent; type locality: Llavac, Infanta Muni., Tayabas Province, Luzon Island (Baisas), PHILIPPINES. *Aedes burgosi* Baisas, type non-existent; type locality: Titunod Creek in Kolambugan, Lanao, Mindanao Island (Guinto), PHILIPPINES.

DISTRIBUTION. Specimens examined: PHILIPPINES, Samar, Mindanao, Leyte, 26 males, 70 females, 25 larvae, 40 rearings. Records from literature: PHILIPPINES, Negros (Banks 1906), Luzon and Mindanao (Baisas 1946).

TAXONOMIC DISCUSSION. The absolute identity of this species remains in doubt because the 2 female specimens upon which it was founded were destroyed during the Second World War liberation of Manila and no topotypic material has yet become available. However, Banks' description was unusually precise (for that period) and it is possible to recognize rather conclusively that he was dealing with the widely distributed Philippine species described above. Some of the Palawan specimens designated as "novotypes" for this species by Baisas (1946) were examined by Knight (1947) and found to be conspecific with *saxicola*.

A. abadsantosi was described by Baisas as being distinct from *rizali* in having the median scutal golden line thickened but not forked at the pre-scutellar area, the submedian and lateral scutal lines not meeting anteriorly to form a loop, and abdominal tergum VIII of the female always possessing a broad white basal band. Regarding the first character, Banks does not describe the median scutal golden line as being forked posteriorly, but states as follows: "A narrow, golden median line from anterior margin halfway through posterior bare brown spot. . ." In connection with the submedian and lateral scutal lines forming an anterior loop in *rizali*, the extent to which the submedian line breaks and bends laterally at the scutal angle varies widely in the large series of Philippine specimens seen by me and there is no indication that it is other than a rather variable character.

This is also true of the extent of the basal white markings on the female abdominal terga. Banks described *rizali* as having the abdominal terga dark except for baso-lateral white patches on VI-VIII. *A. abadsantosi* is described as having tergum VIII constantly with a broad white basal band, V-VII sometimes also banded basally, and III-IV with scattered basal pale scales. Fifty-six females with abdomens suitable for examination were available to me. Among these specimens dorsal abdominal markings varied from complete basal banding on segments II-VIII to having only a narrow band on VII. The extent of dorsal abdominal markings is a notoriously variable character at best, and no evidence presently exists that this character can be used here for separation of species.

Although it appears that nearly the entire range of variation can be found in any single population, it is true that northern populations (Luzon, Leyte, and Samar) have a high percentage of individuals with complete banding on at least segments III-VIII, and southern populations (Negros and Mindanao) have fewer segments banded and such bands or markings as occur are less well developed. It is possible that incipient species are developing and even now are biologically distinct. However, in the absence of biological studies of the variation found here, it is considered necessary to treat all of this material as a single species.

A. burgosi was considered to be distinct from *rizali* and *abadsantosi* by Baisas on the basis of having more bristles on the ninth tergum. However, here again a perfect continuum exists and *burgosi* is accordingly synonymized to *rizali*.

BIOLOGY. The larva is commonly found in the water collected in rock holes in and along the stream beds of forested streams. The rock pools may be small or large, and in shade or sun. Occasionally, the larvae are

also found in hollows on roots or fallen logs along stream beds.

Nothing has been reported on the habits of the adults except that the 2 females of the type series of *rizali* were collected in the act of biting (Banks 1906).

Aedes (*Finlaya*) *Saxicola* EDWARDS
(Figures 10, 11)

- Hulecoeteomyia fluviatilis* Leicester (non Lutz 1904) 1908, Cul. Malaya : 111 (♂, ♀).
Aedes (*Finlaya*) *saxicola* Edwards 1922, Indian J. med. Res. 10: 262 (nomen novum for *fluviatilis*); Barraud 1934, Fauna Brit. India 5: 191 (♂*, ♀*, L*); Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 628 (♂*, ♀, L*); Knight and Hull 1951, Pacif. Sci. 5: 239 (taxonomy).
Finlaya greigi Barraud 1923, Bull. ent. Res. 13: 406 (♂, ♀); Edwards 1932, in Wytsman, Genera Insect. fasc. 194: 151 (synonymy).
Aedes (*Finlaya*) *rizali* Banks, Baisas 1946, Mon. Bull. Philipp. Hlth. Serv. 22(3): 21 (misidentification).

FEMALE. *Head.* Torus with dark scales mesally; palpus with a few pale scales apically; proboscis all dark scaled; vertex with medial upright forked scales usually dark. *Thorax.* Anterior pronotum with broad white scales; posterior pronotal scaling extremely variable, ranging from narrow to narrow-curved and even to broad scales, these scales may all be yellowish or all brownish or with all combinations in between, they may be numerous over entire dorsal portion of area or scanty; median scutal line forked at prescutellar space, sometimes appearing posteriorly tapered; submedian line broken at level of scutal angle with anterior end of its posterior portion bent briefly antero-laterally along scutal angle, anterior portion more weakly developed than posterior portion, sometimes nearly obsolescent; line over wing base usually rather diffused, sometimes even obsolescent, anteriorly well separated in area of scutal angle from submedian line; prealar scale patch distinctly separate from upper sternopleural scale patch; paratergite and subspiracular area without scales. *Legs.* Fore femur anteriorly dark, with a baso-ventral line of pale scaling; mid femur usually with some pale scales along anterior midline; hind femur with anterior submedial white area sometimes connecting dorsally with posterior white area, apico-ventral pale area extensively produced onto anterior surface; fore and mid tarsi with distinct basal white areas on I-II; hind tarsus with prominent basal white bands on I-III, that on III dorsally occupying approximately half or more of the segment, a few basal white scales may be present on IV. *Abdomen.* Terga dorsally dark scaled, baso-lateral silvery-white spots usually visible dorsally on VII-VIII, those on VIII sometimes forming a complete band; often a small medio-basal patch of brownish-yellow scales on some terga. *Variation.* A female specimen (00474-100) in the USNM from Thailand perfectly resembles this species except the prealar and upper sternopleural scale patches are continuous without any evidence of discontinuity. The anterior

surface of the mid femur and the dorsal aspect of the terga are entirely dark scaled. There is a similar female specimen (33) in the BM from Hainan Island. This differs from the first, however, in having a medio-basal patch of brownish-yellow scales dorsally on terga III-VII. Since the confluence or discontinuity of the prealar and upper sternopleural scale patches is seldom subject to variation within the *chrysolineatus* subgroup, it is possible that these specimens represent a presently unrecognized species. A series of specimens from the Thailand changwats of Chanthaburi and Nakhon Si Thammarat include in their number several individuals which have 2 subspiracular scales, tergal basal bands (laterally disconnected from baso-lateral spots), and broad dark scales dorso-posteriorly on the anterior pronotum. Some of the males of this series have ventral pale scaling along both IV and V.

MALE. *Head.* Palpus dark, baso-ventral white scaling on terminal segment; proboscis dark scaled. *Abdomen.* Terga dorsally dark scaled, with a baso-medial spot of pale scales on III-VI, may be reduced to just a few pale scales on some segments, baso-medial spots may occasionally form narrow basal white bands by connecting laterally with baso-lateral spots. *Terminalia.* (Figure 10.) Tergal lobes of IX each with approximately 7-14 setae; claspette filament with taper beginning at or just beyond middle. *Variation.* Two male specimens from Malaya have the anterior surface of the middle femur all dark.

PUPA. Chaetotaxy as shown in Figure 11.

LARVA. (Figure 10.) *Head.* Integument with a noticeable droplet-like rugosity; hairs 5, 6-C with 5-8 branches; 14-C and basal maxillary hair (bmh) well developed, somewhat stellate in form, 14-C with 2-5 branches, bmh with 3-7. *Thorax.* Without obvious pilosity; hair 1-P with 3-4 branches; 3-P with 4-5; 8-P with 2-4; 14-P with 2-4; 1-M with 2-4 elongate very stout barbed branches; 1-T quite variable in development, with 1-6; 5-T with 1-2; 7-T very stout, about half length of 6-M, with 3-5 heavily barbed rather blunt-ended branches, very unlike 6-M in shape and development. *Abdomen.* Integument with fine unbranched pile, increasing posteriorly; hair 1-I-II rather stellate, elongate on III-VII, with 1-4 branches; 13-I-II short, somewhat stellate; comb consisting of 53-70 scales, each scale narrow, elongate, slightly tapered, with a lateral and apical fringe, sometimes with a short stout apical spicule; siphon non-pilose, index approximately 2.5-3.3; siphon hair tuft with tips not attaining siphon apex; pecten with 14-19 teeth, 3-6 inserted beyond attachment of siphon hair tuft (are the largest and may be irregularly spaced), more basal teeth with 1-2 very small ventral denticles medially; hair 1-X stout, barbed, considerably longer than saddle, single; ventral brush without precratal tufts. *Variation.* Very extensive variation occurs in the development of thoracic and abdominal hairs. One form has 1-T, hair 1-III-VII, and hair 6-I-VI all strongly developed and single; and other hairs in general showing a reduction in numbers of branches. Conversely, a true stellate form exists in which the following hairs become elongate, stellate, and possessed of many more branches: 8-P; 14-P; 1-M; 14-M; 1-T; 13-T; 1, 2, 5, 11, 13-I-II; and 2, 5-III-VI. Fairly conspicuous body pilosity can also occur on these larvae. The development of "hairy" forms

of mosquito larvae has been discussed by Rosen and Rozeboom (1954), Colless (1956), and Reid (1963), and it is apparently an environmentally-induced condition.

TYPE DATA. *Hulecoeteomyia fluviatilis* Leicester, type non-existent; type locality: Ulu Gombak (Leicester), MALAYSIA. *Finlaya greigi* Barraud, male and female cotypes in British Museum; type locality: Haflong, Cachar Hills, Assam (Barraud), INDIA.

DISTRIBUTION. Specimens examined: PHILIPPINES, Palawan, 7 males, 9 females, 7 larvae, 5 rearings. MALAYSIA, Selangor, Cameron Highlands, 4 males, 3 females, 3 rearings. THAILAND, Chumphon, Banong, Narathiwat, Pattalung, Songkhla, Chiang Mai, Nakhon Nayok, Trad, Ranong, Pathum Thani, Trang, Khaulan, Chanthaburi, Nakhon Si Thammarat, 19 males, 77 females, 168 larvae, 38 rearings. JAVA, Tjisanoea, Ngadisari, 2 males, 3 females. BORNEO, Lg. Tebangan, Sarawak and Heningau, N. Borneo, 6 males, 9 females. SUMATRA, Arastagi, 1 male. Records from literature: INDIA, Eastern Himalayas, Assam (Barraud 1934). MALAYSIA, Wray's Hill, Pahang (Edwards 1928). SINGAPORE, Pulau Oban (Edwards and Given 1928). JAVA, Mt. Salak (Barraud 1934). THAILAND (Causey 1937).

TAXONOMIC DISCUSSION. This species, while nearest to *A. jugraensis*, more or less stands alone in the *chrysolineatus* subgroup. Although subject to extensive variation, the adult is distinctive in having the proboscis all dark scaled, the median longitudinal line forked posteriorly, and the mid femur with the anterior and antero-dorsal surfaces dark apically. The larva is distinctive from all of the others except *jugraensis* in the highly modified form and development of hair 7-T.

BIOLOGY. The larva is commonly found in rock holes and pools in the beds of jungle streams. These pools may be very small or large, may be entirely in shade or at least part of the time in the sun, and may be with or without leaves on the bottom. On occasion, it may occur in tree holes and in hollows on top of fallen logs. One or 2 records each exist for such different places as coconut half shells, a water jug, bamboo, seepage in small hole, and in a sump. Whether these represent errors or valid collections cannot now be determined. The adult female has been taken on several occasions in human biting collections in forest.

Aedes (Finlaya) sherki KNIGHT
(Figures 7, 12)

Aedes (Finlaya) sherki Knight 1947 (1948), Ann. ent. Soc. Amer. 40: 645
(♂, ♀, L).

FEMALE. *Head*. Torus with dark scales mesally; palpus with a few pale scales apically, occasionally a few pale scales apically on penultimate segment; proboscis all dark scaled; upright forked scales of vertex usually dark. *Thorax*. Anterior pronotum with a few narrowed yellowish scales above, broad creamy scales below; posterior pronotum sparsely covered with narrow-curved yellowish scales, some of posterior scales may be

broadened, occasionally a few dark scales medially; median scutal line extends posteriorly nearly across prescutellar area, not forked posteriorly; submedian line broken at level of scutal angle with its posterior portion bent briefly antero-laterally along the angle, line over wing base anteriorly does not connect at scutal angle with outcurved portion of submedian line; prealar scale patch distinctly separate from upper sternopleural scale patch; paratergite and subspiracular area without scales. *Legs.* Fore femur anteriorly dark, with a baso-ventral line of pale scaling; mid femur anteriorly dark; hind femur with apico-ventral pale area broadly produced anteriorly but not ringing apex; fore tarsus and sometimes mid tarsus with a small basal patch of white scales on III (as well as on I-II); hind tarsus with first 4 tarsomeres basally banded. *Abdomen.* Terga dorsally dark scaled, sometimes with a small medio-basal creamy patch on 1 or more of segments, VII with baso-lateral silvery-white spots extending prominently onto dorsum; VIII with a complete basal white band.

MALE. *Head.* Palpus dark, a few pale scales over joints between II-III and III-IV; proboscis dark scaled. *Abdomen.* Terga with complete broad basal white bands on III-VII, sometimes bands narrowed dorsally or with dorsal portion separated from dorso-lateral spot on 1 or more segments. *Terminalia.* (Figure 7.) Tergal lobes of IX each with approximately 9-14 setae; claspette filament slightly widened medially.

PUPA. Chaetotaxy similar to *saxicola* (Figure 11).

LARVA. (Figure 12.) Body clothed with stellate hairs and with pile. *Head.* Hairs 5, 6-C with 5-8 branches; 11-C, 14-C, and basal maxillary hair (bmh) stellate, 14-C with 3-6 branches, bmh with 6-10. *Thorax.* Integument heavily pilose, pile unbranched; hair 1-P with 4-9 branches; 3-P with 5-13; 8-P stellate, with 6-12; 14-P stellate, with 5-11; 1-M stellate, with 2-12; 1-T stellate, with 9-16; 5-T stellate, with 6-11; 7-T with 7-16, similar in shape and development to 6-M. *Abdomen.* Integument heavily pilose, pile simple or branched, many stellate hairs; 1-I-III stellate; 5-IV-VII elongate, with 5-7 branches on IV, 3-5 on V, 3-7 on VI-VII; comb consisting of 62-73 scales, each scale narrow, elongate, with a conspicuous lateral fringe, apical spicule sometimes conspicuously more developed than adjacent lateral spicules; siphon pilose, index 3.4-4.0; siphon hair tuft with tips extending beyond siphon apex; pecten with 15-20 teeth, 4-5 teeth beyond siphon hair tuft, most of teeth with 1-3 ventral denticles, apical 2-3 teeth ventrally out of line with others, tip of most apical tooth usually extending beyond siphon apex; hair 1-X with 2, rarely 3, equal branches, longer than saddle; ventral brush without precratal tufts.

TYPE DATA. Holotype male in U. S. National Museum; type locality: Baguio, City of Baguio Province, Luzon Island (Rozeboom), PHILIPPINES.

DISTRIBUTION. Specimens examined: PHILIPPINES, Luzon, 51 males, 57 females, 17 larvae, 5 rearings.

TAXONOMIC DISCUSSION. This species is very closely related to *rizali*, differing from that species only in possessing basal white bands on hind tarsomeres I-IV (instead of only on I-III).

BIOLOGY. As with *rizali*, the larva is found in the water collected in rock holes in and along the stream beds of forested streams. Records also exist of the larva occurring in artificial containers.

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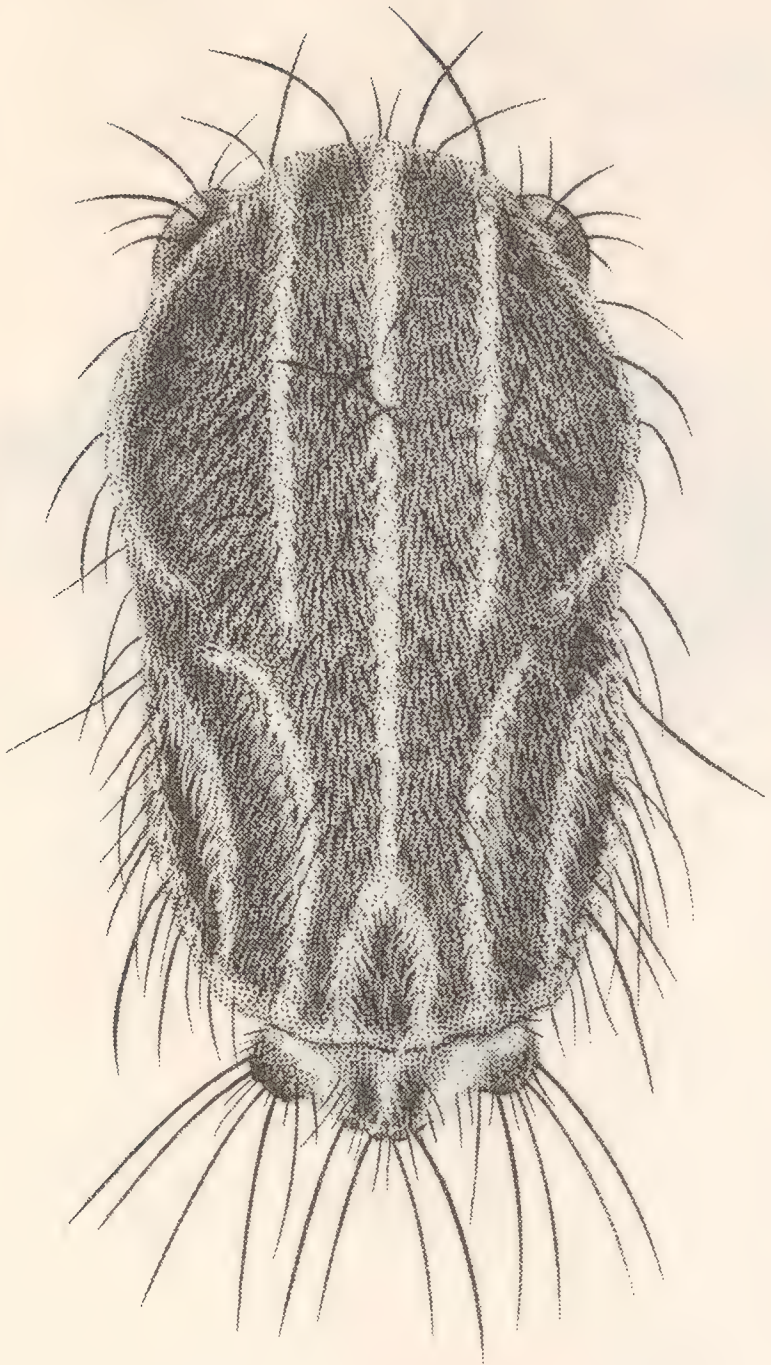
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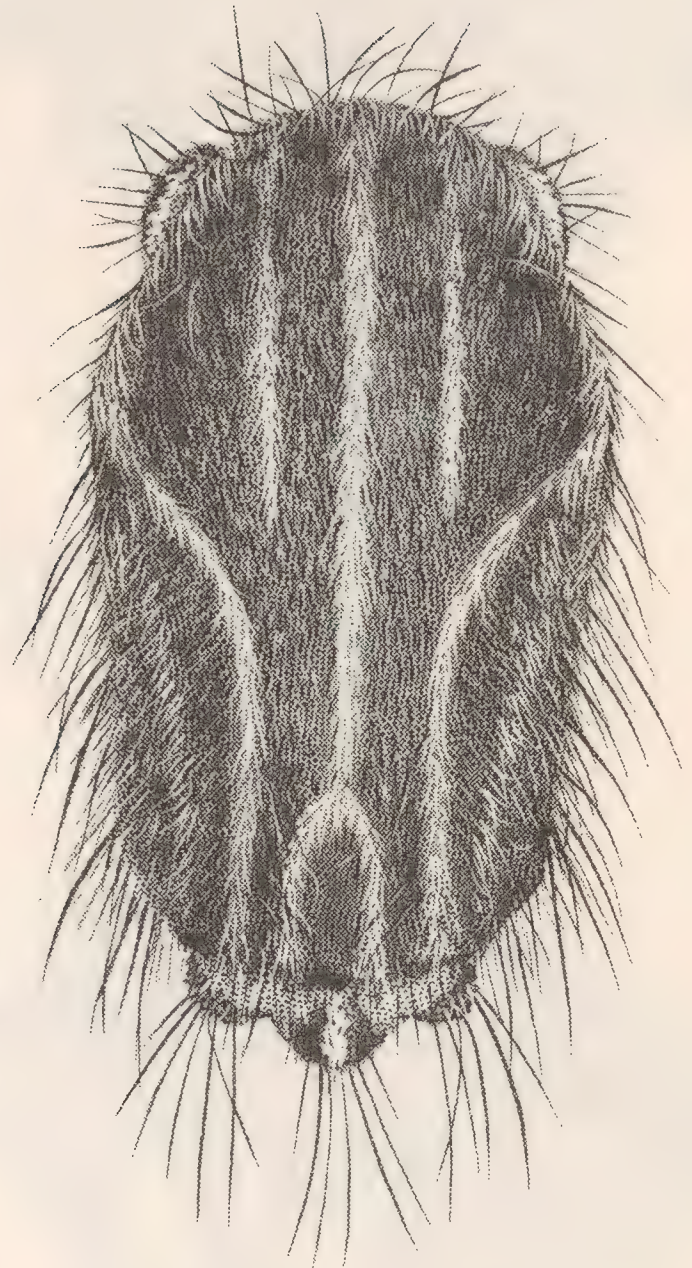
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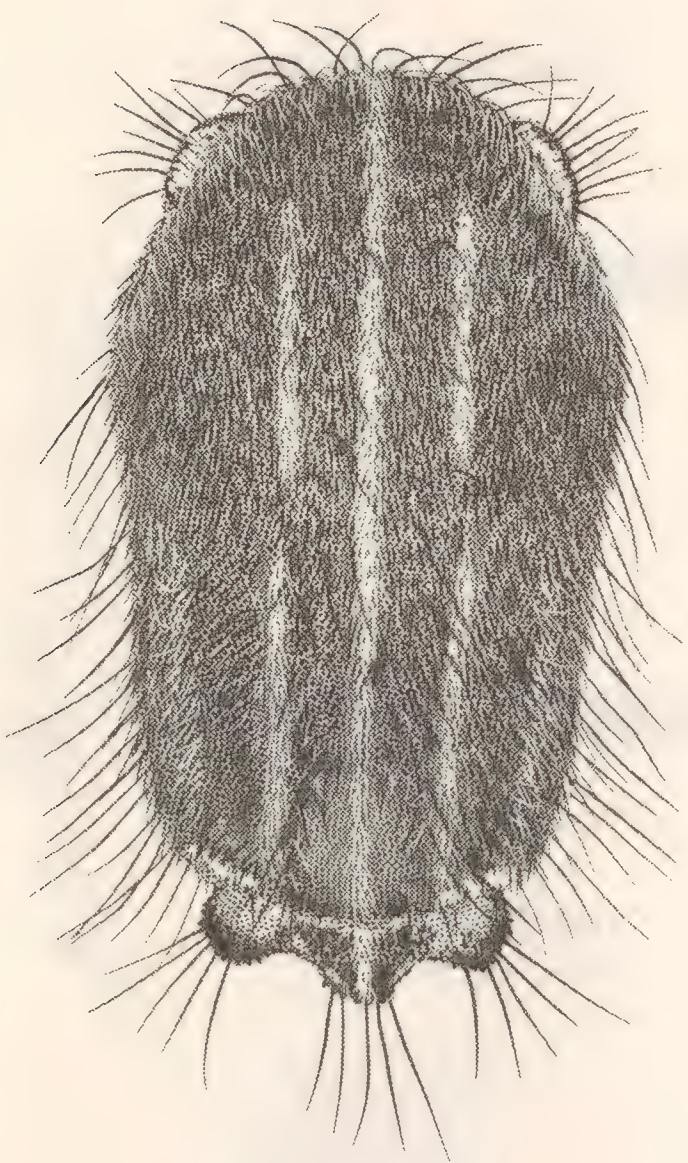
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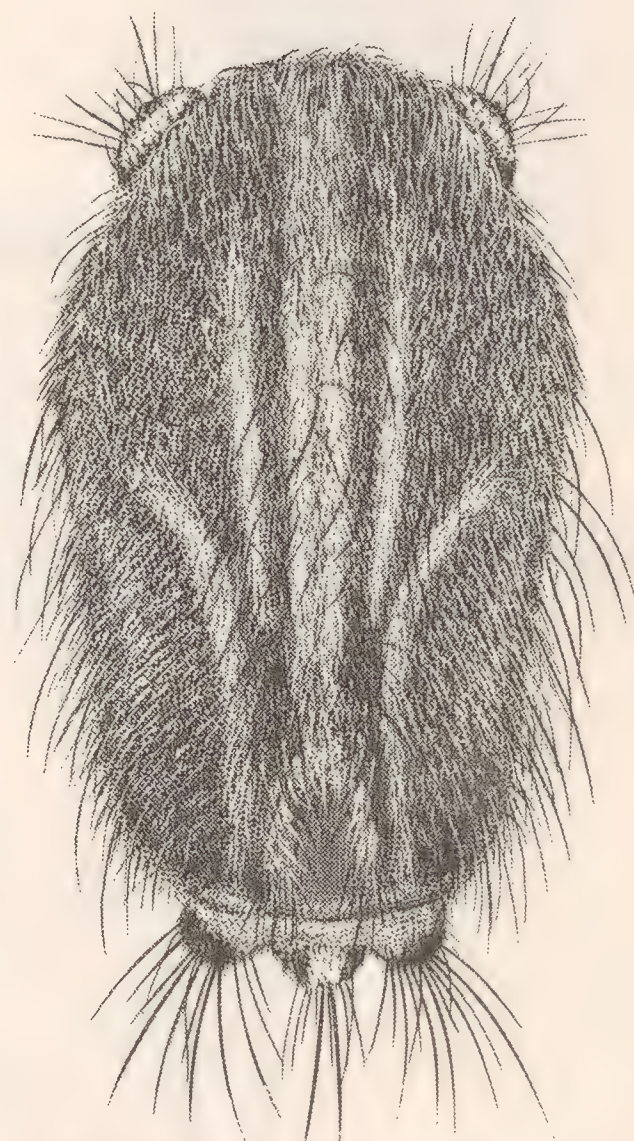
chrysolineatus



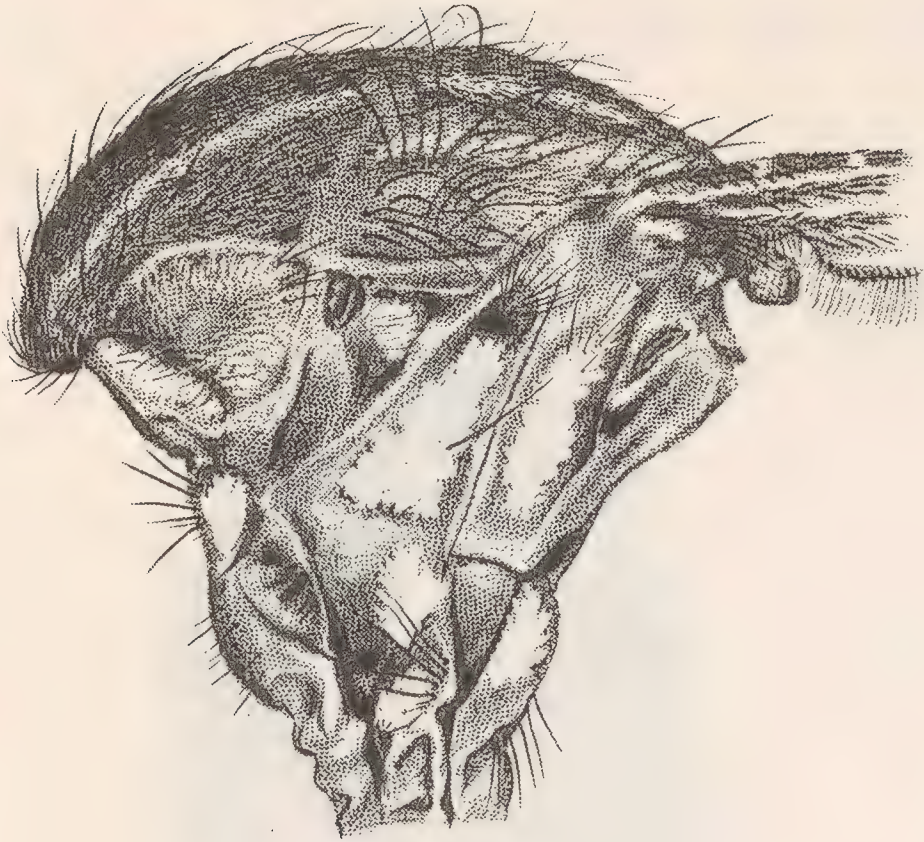
formosensis



jugraensis



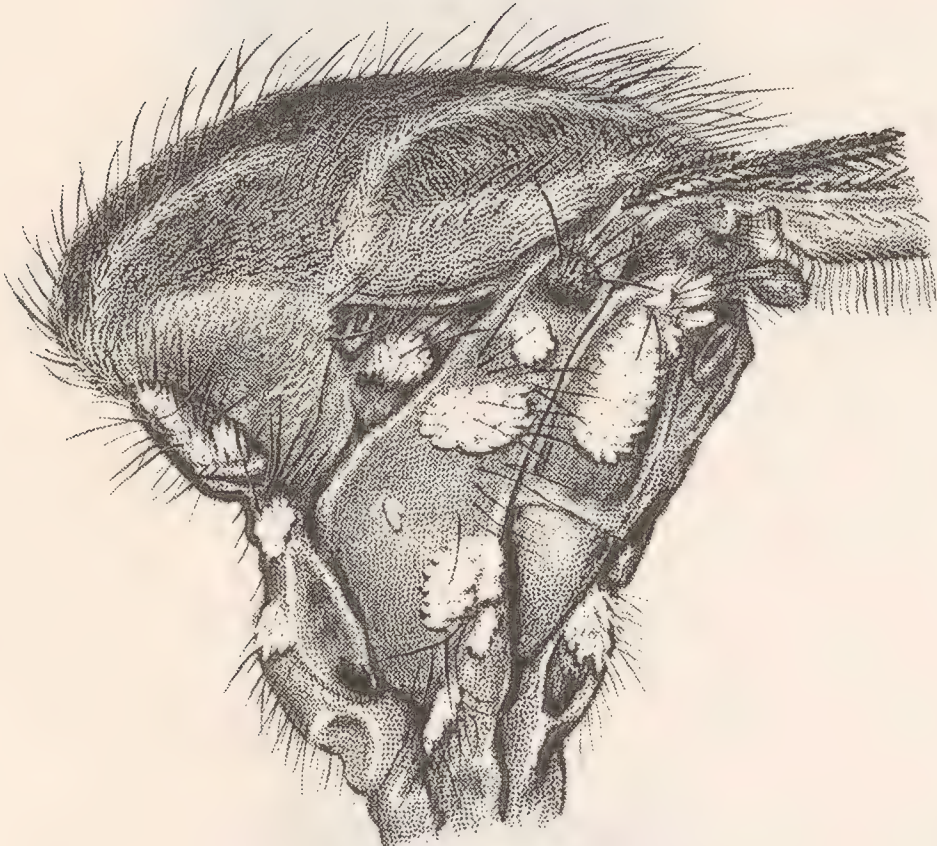
japonicus shintienensis



jugraensis



formosensis



rizali



japonicus shintienensis
(mid femur)



chrysolineatus
(hind femur)

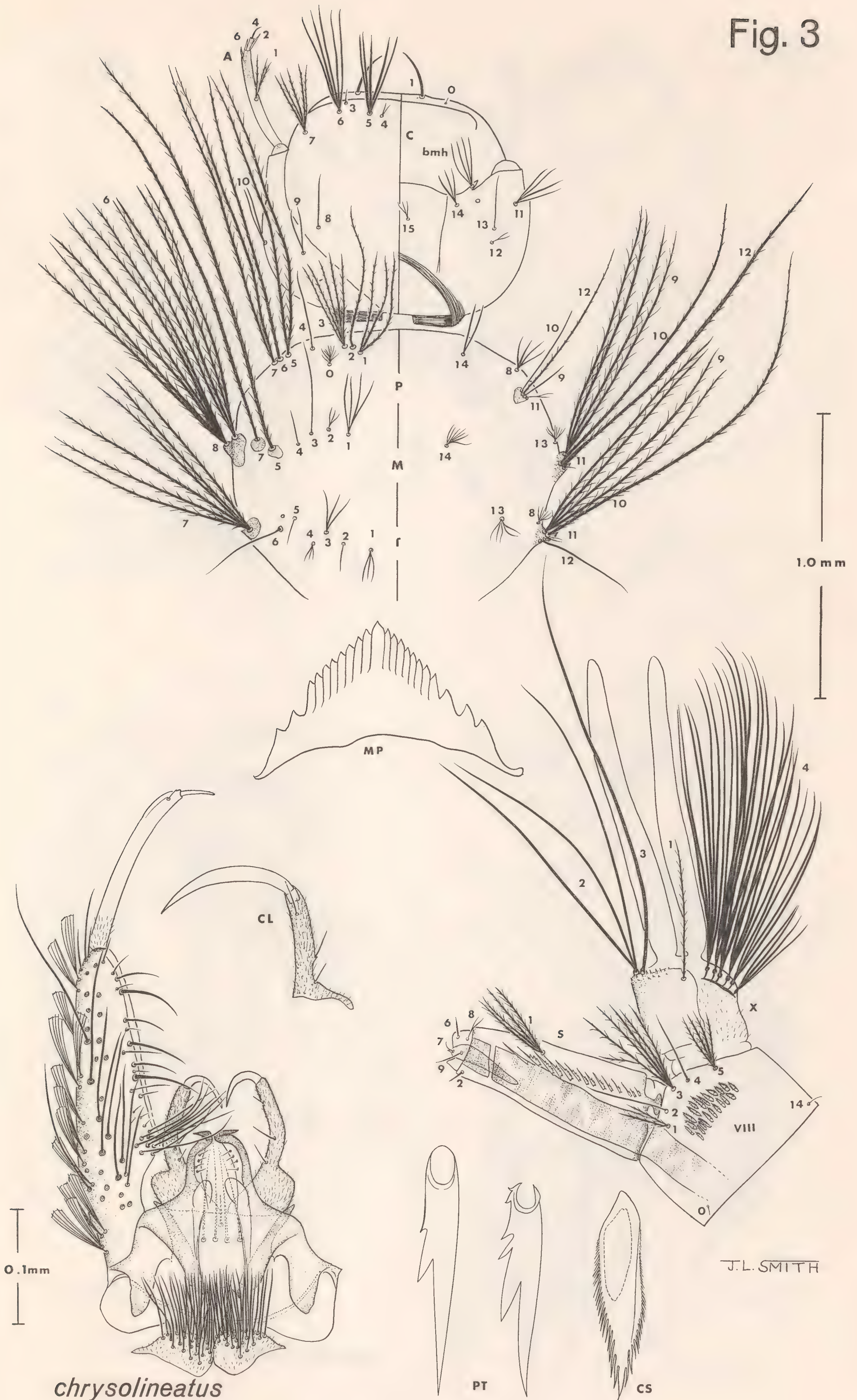


japonicus shintienensis
(hind femur)



jugraensis
(hind femur)

Fig. 3



chrysolineatus

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PT

CS

Fig. 4

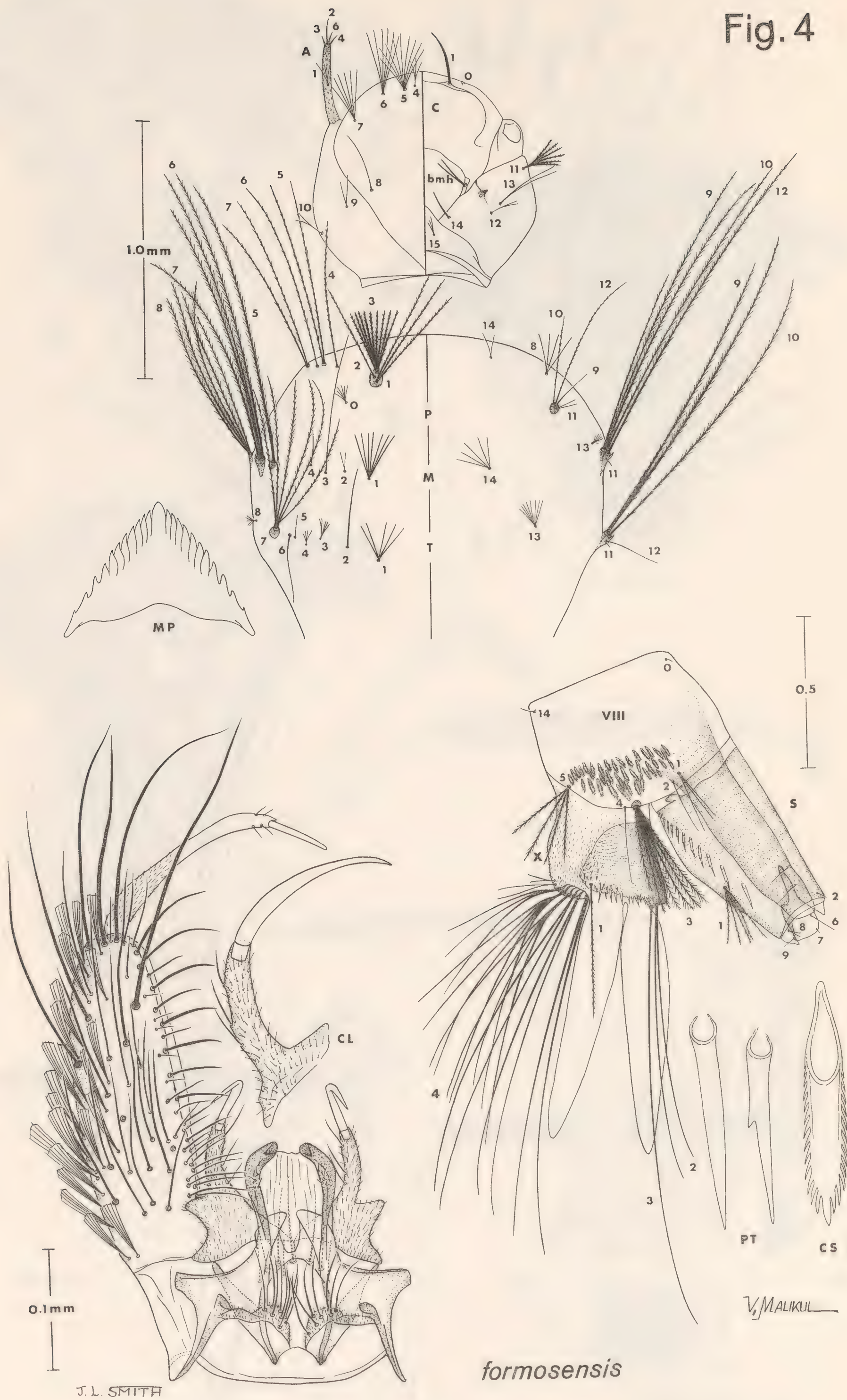
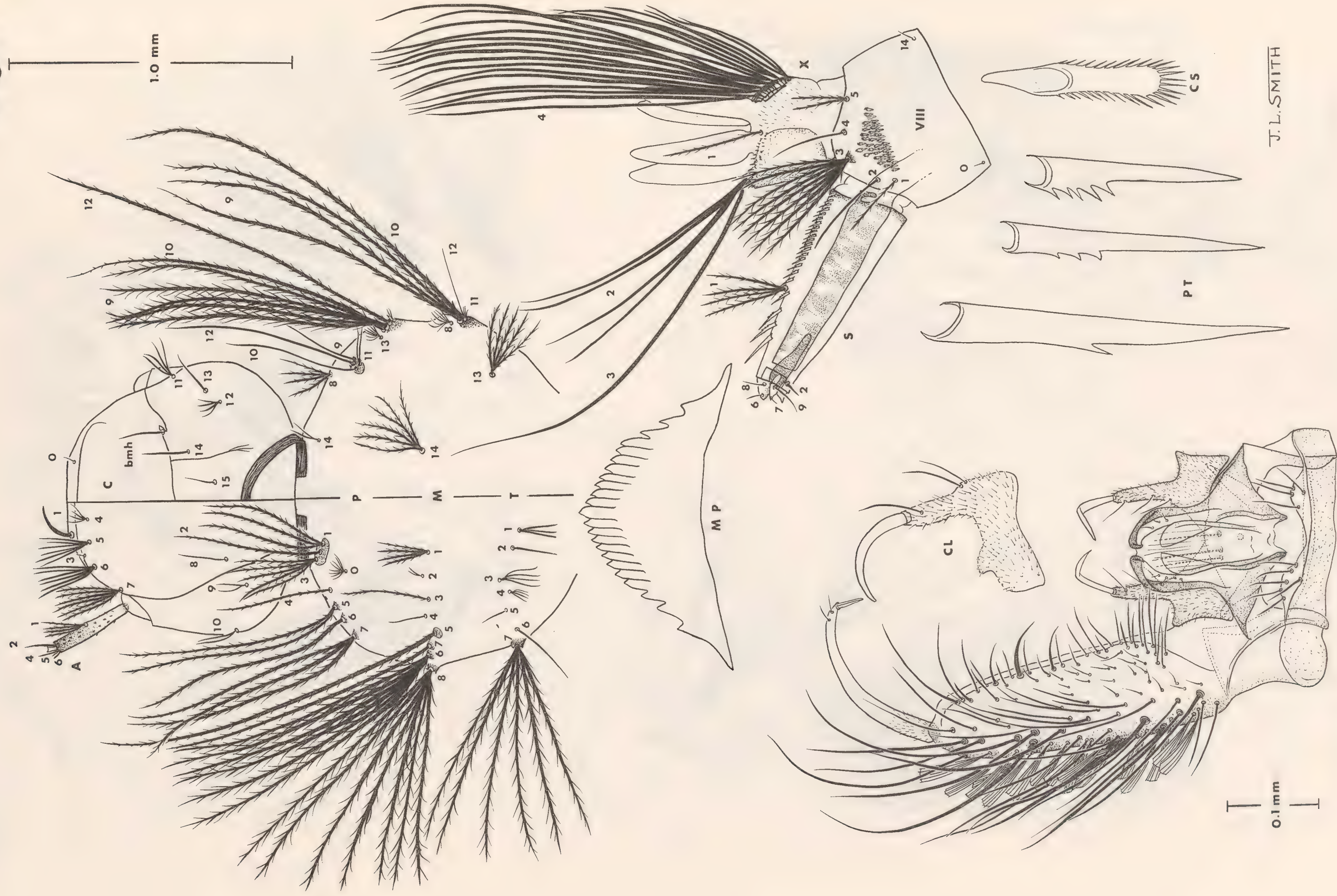


Fig. 6



1.0 mm

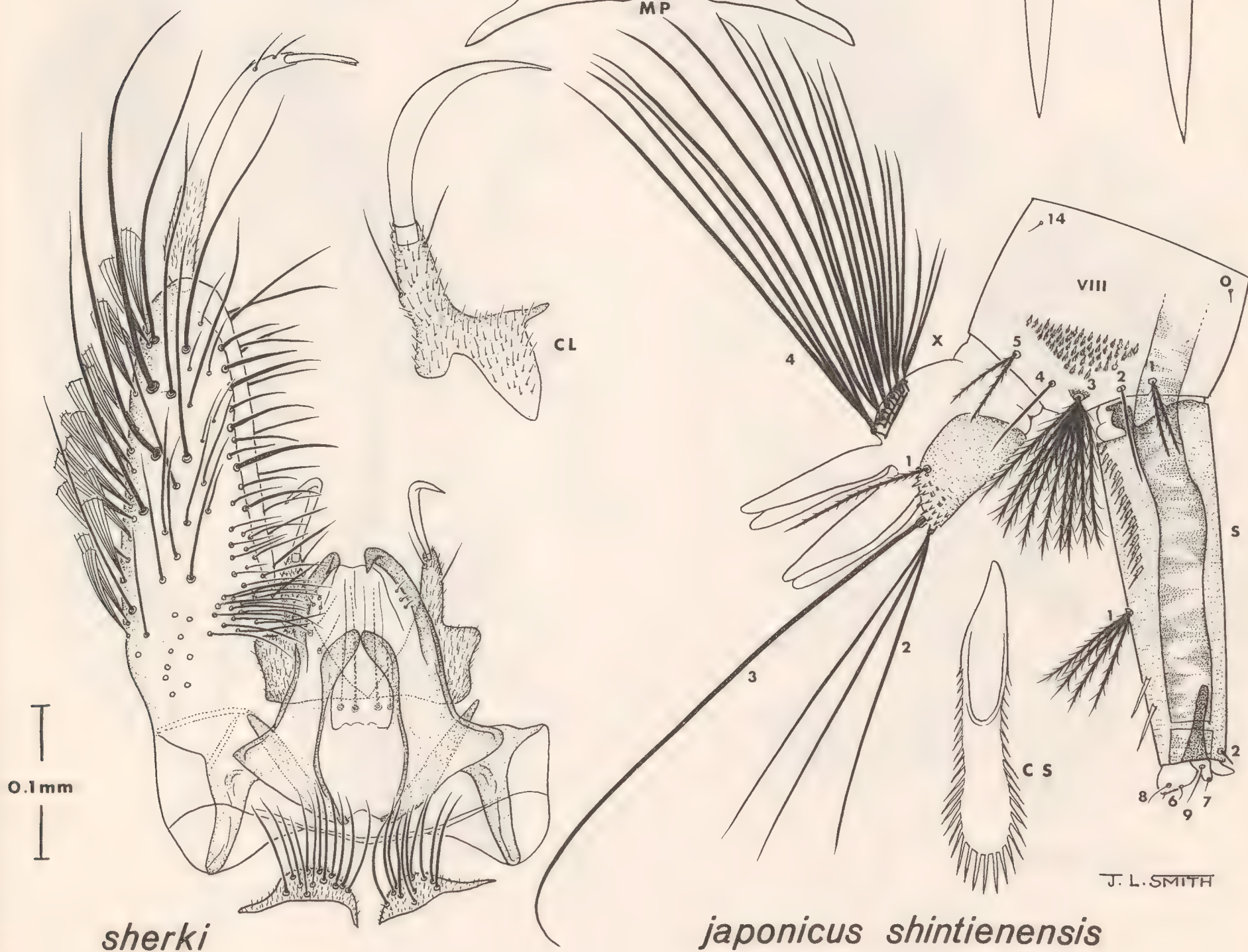
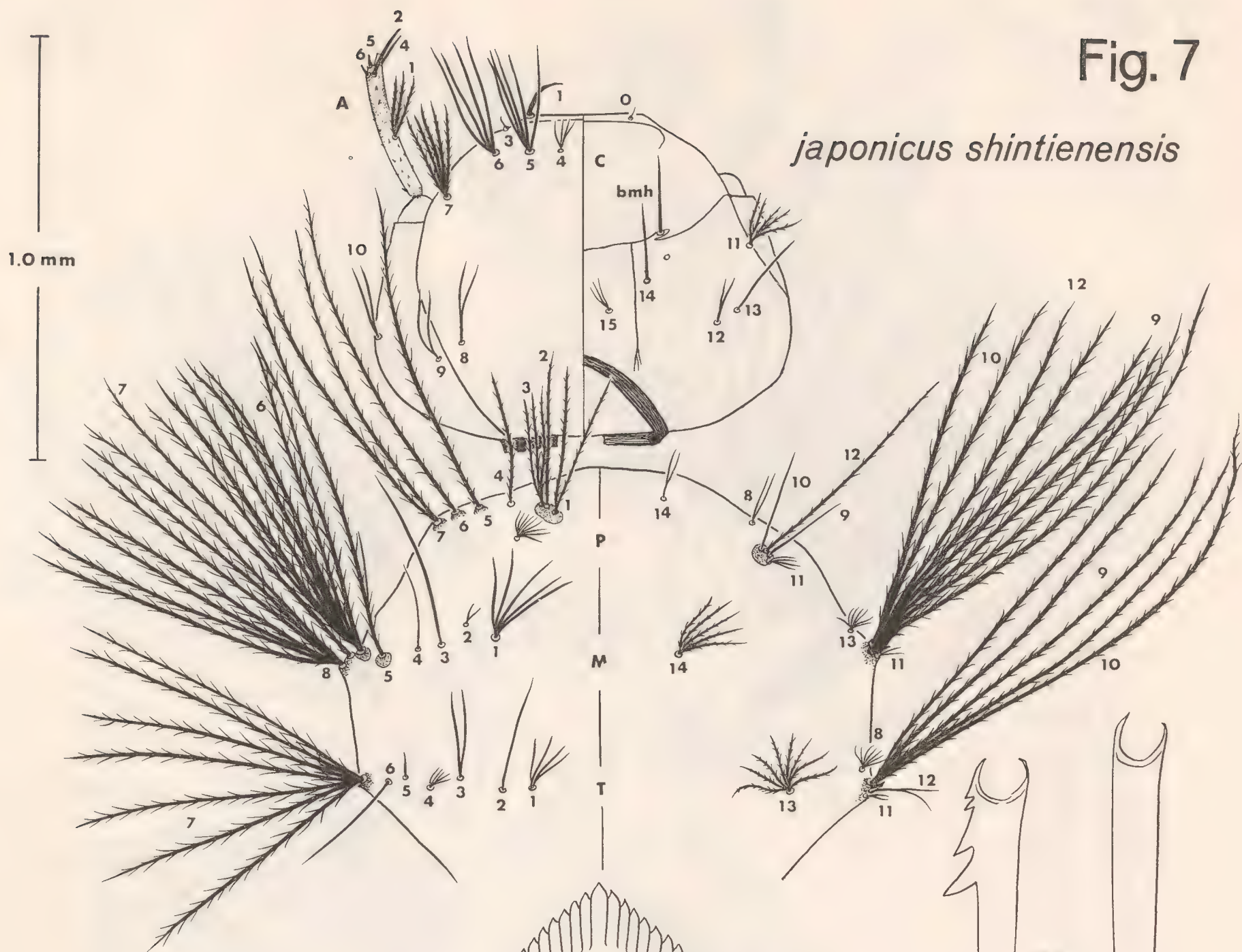
0.1 mm

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japonicus japonicus

Fig. 7

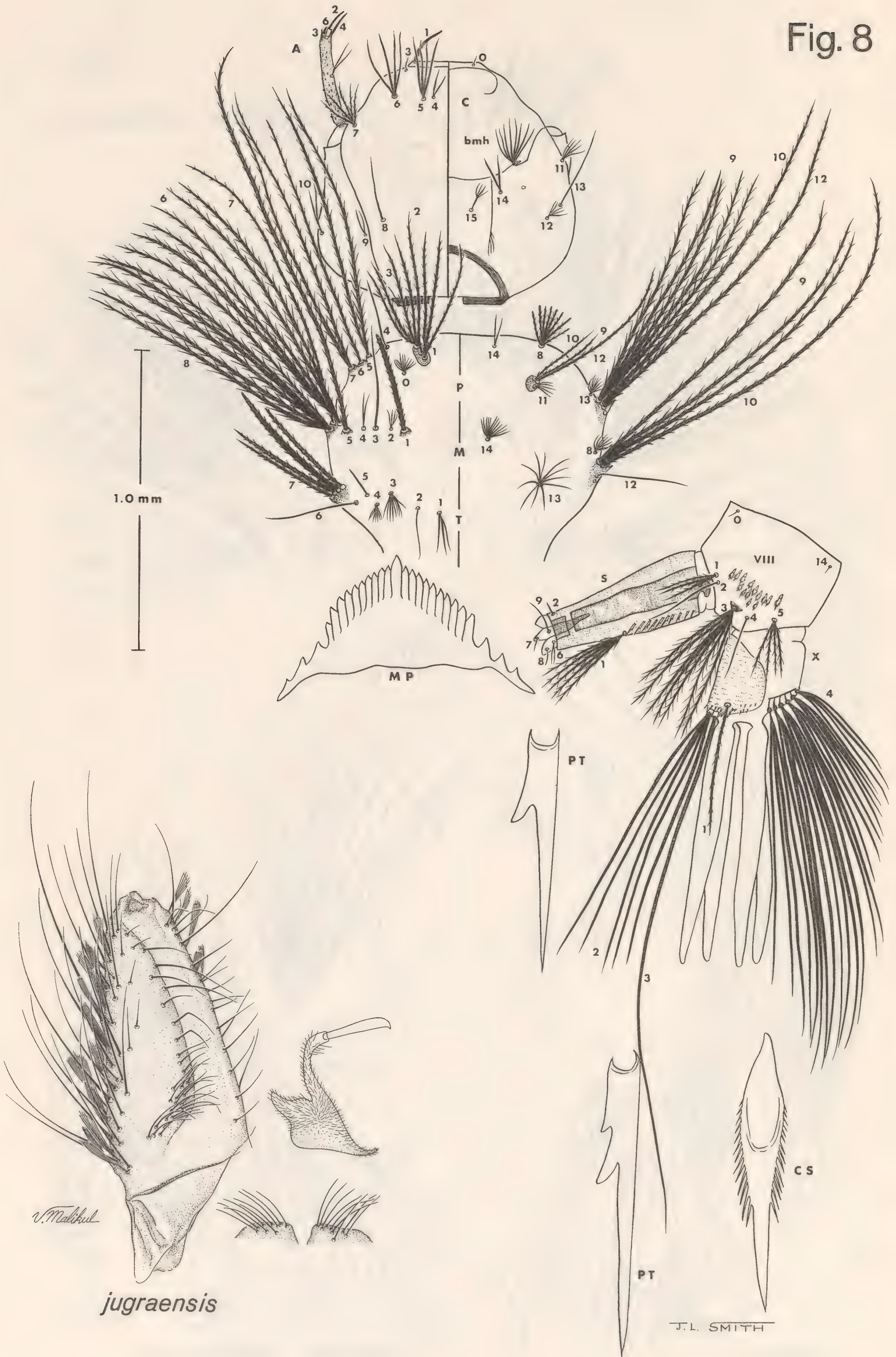
japonicus shintienensis



sherki

japonicus shintienensis

Fig. 8

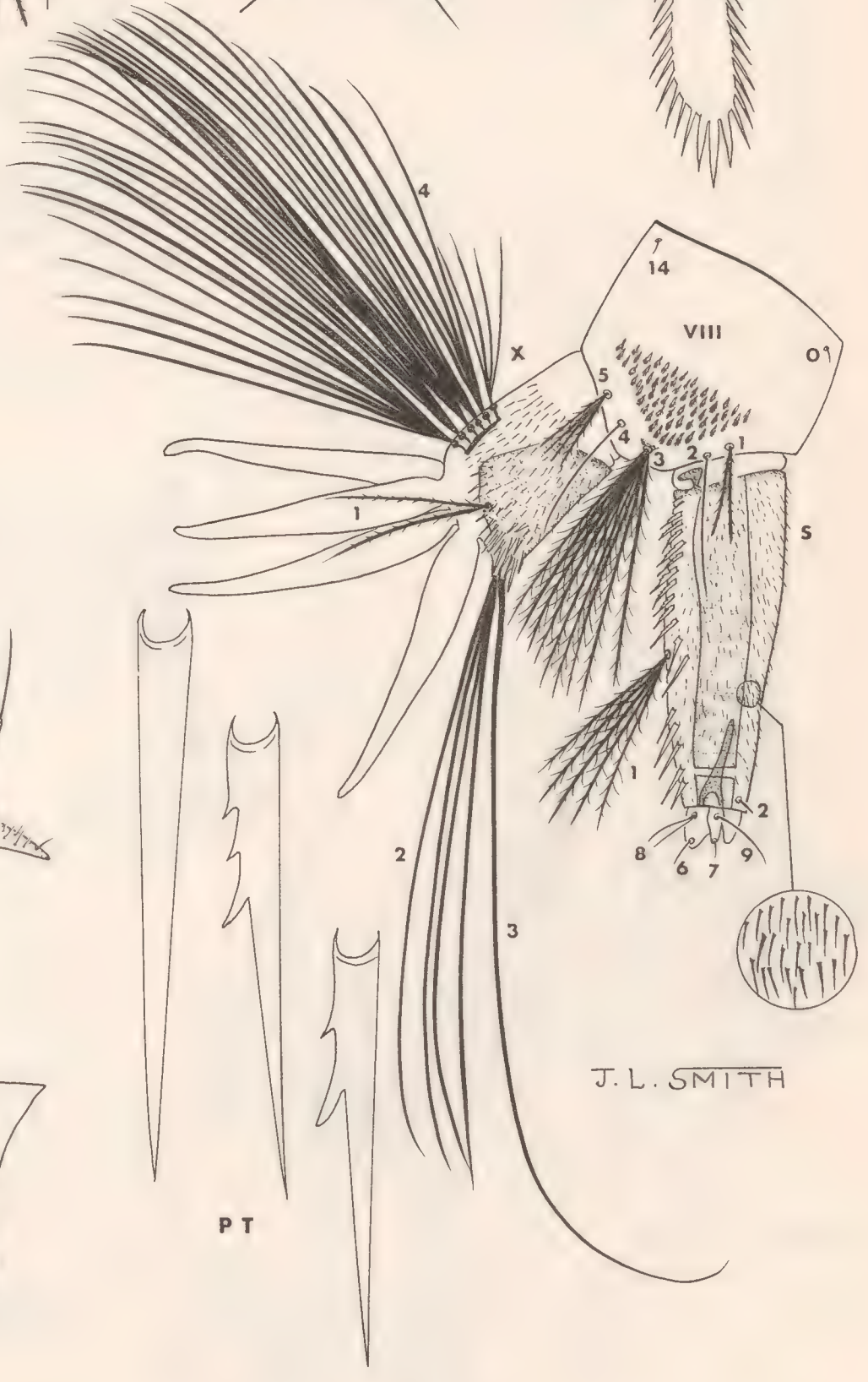
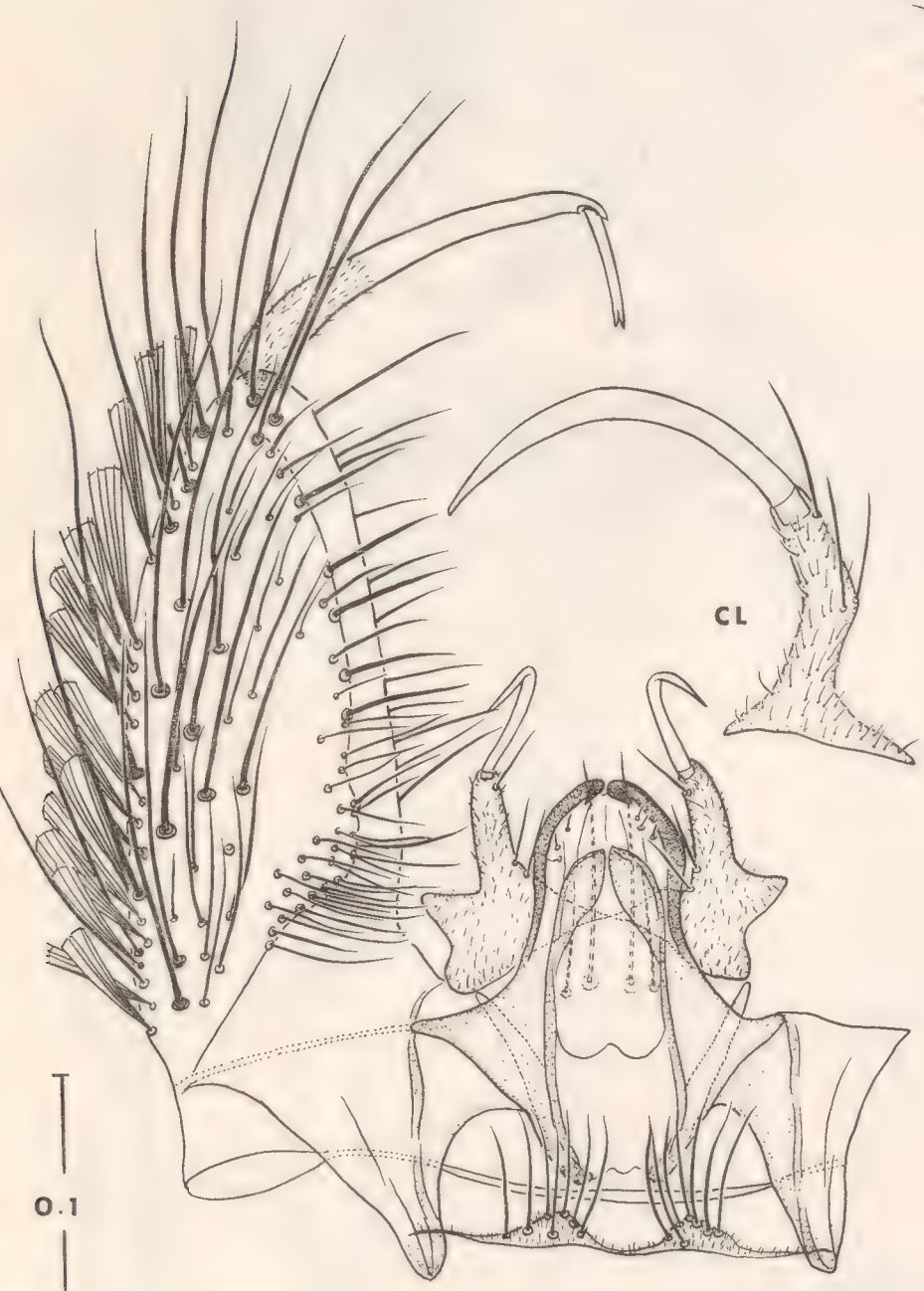


jugraensis

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Fig. 9

1.0 mm



rizali

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Fig.10

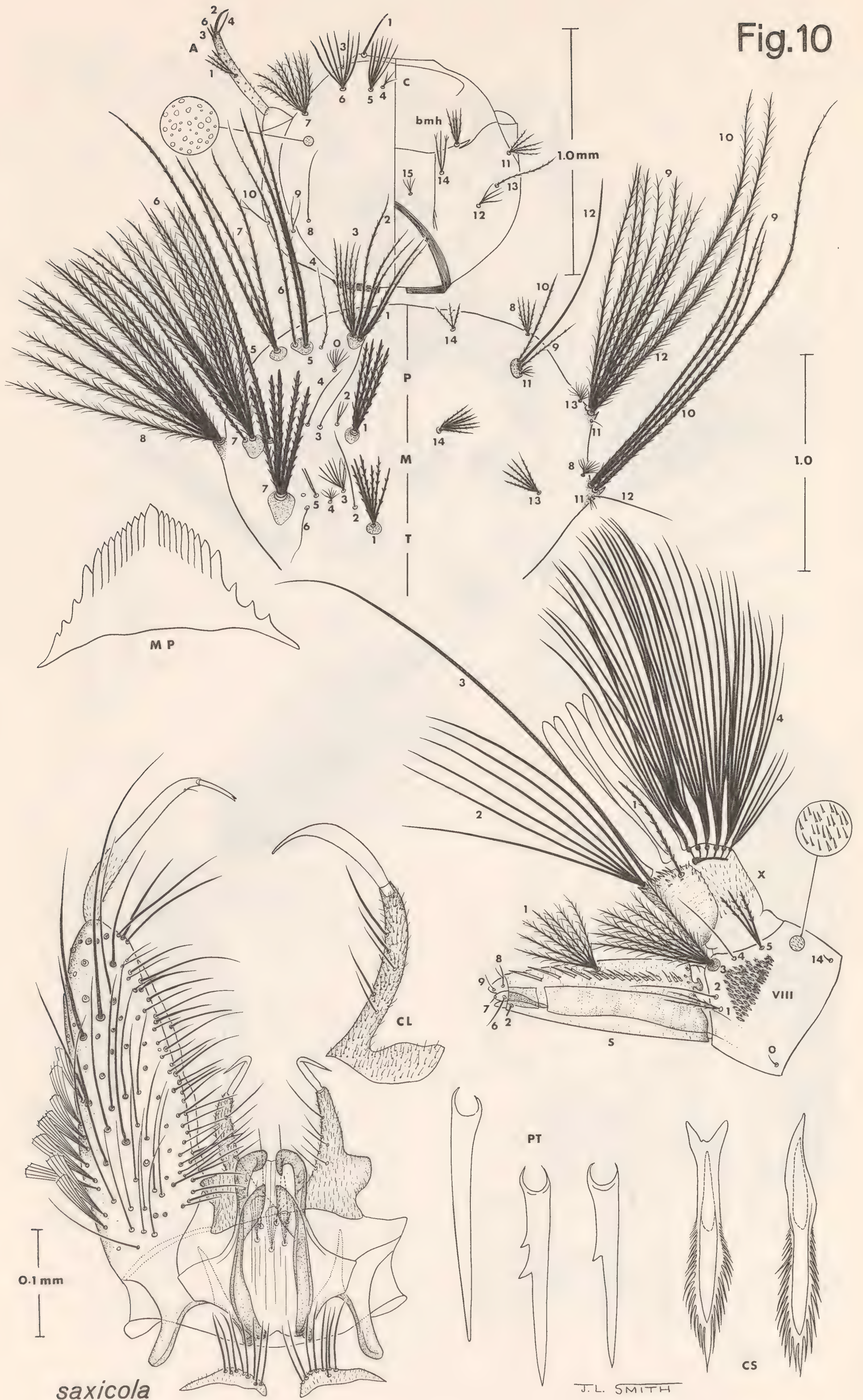
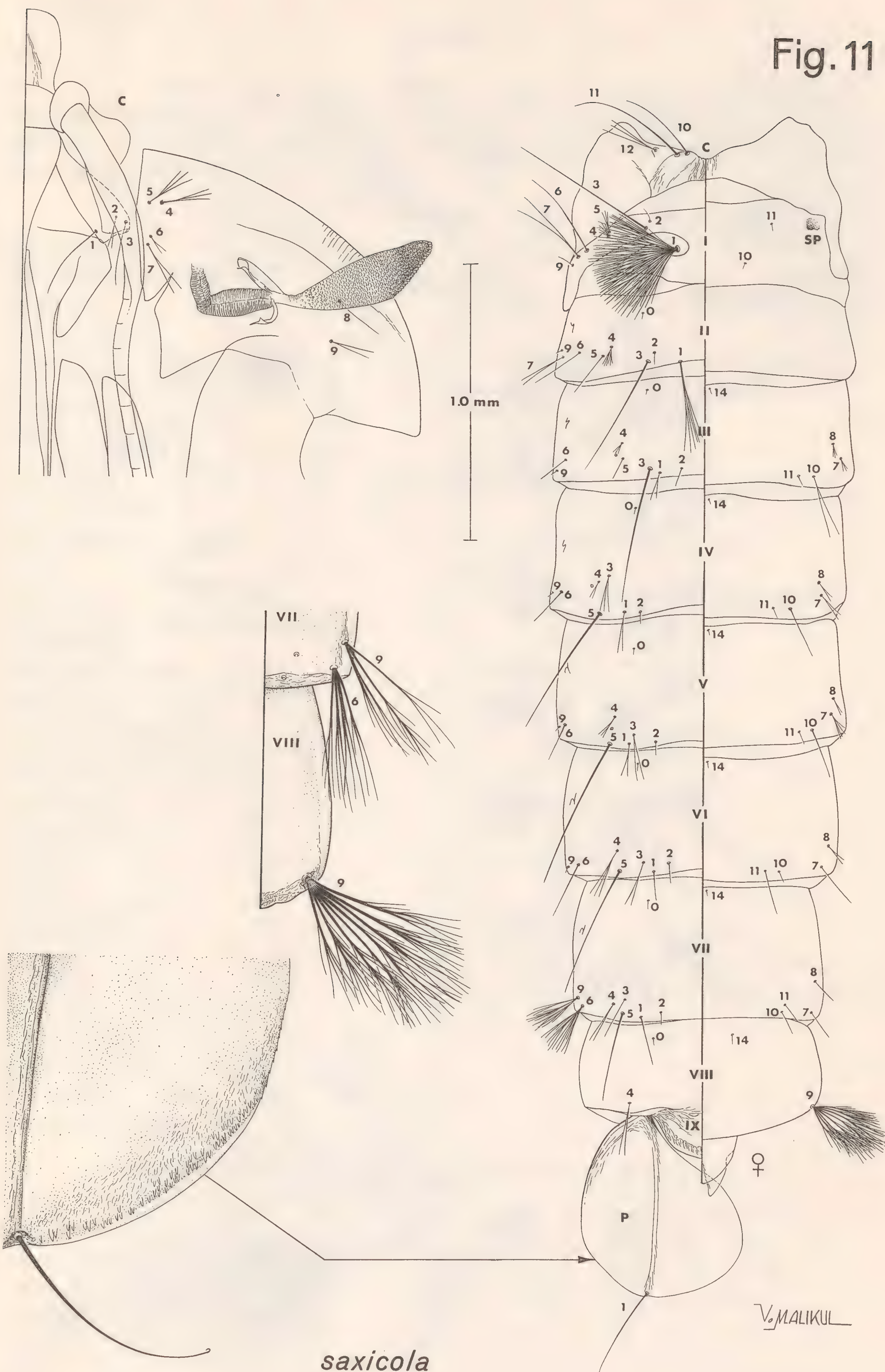


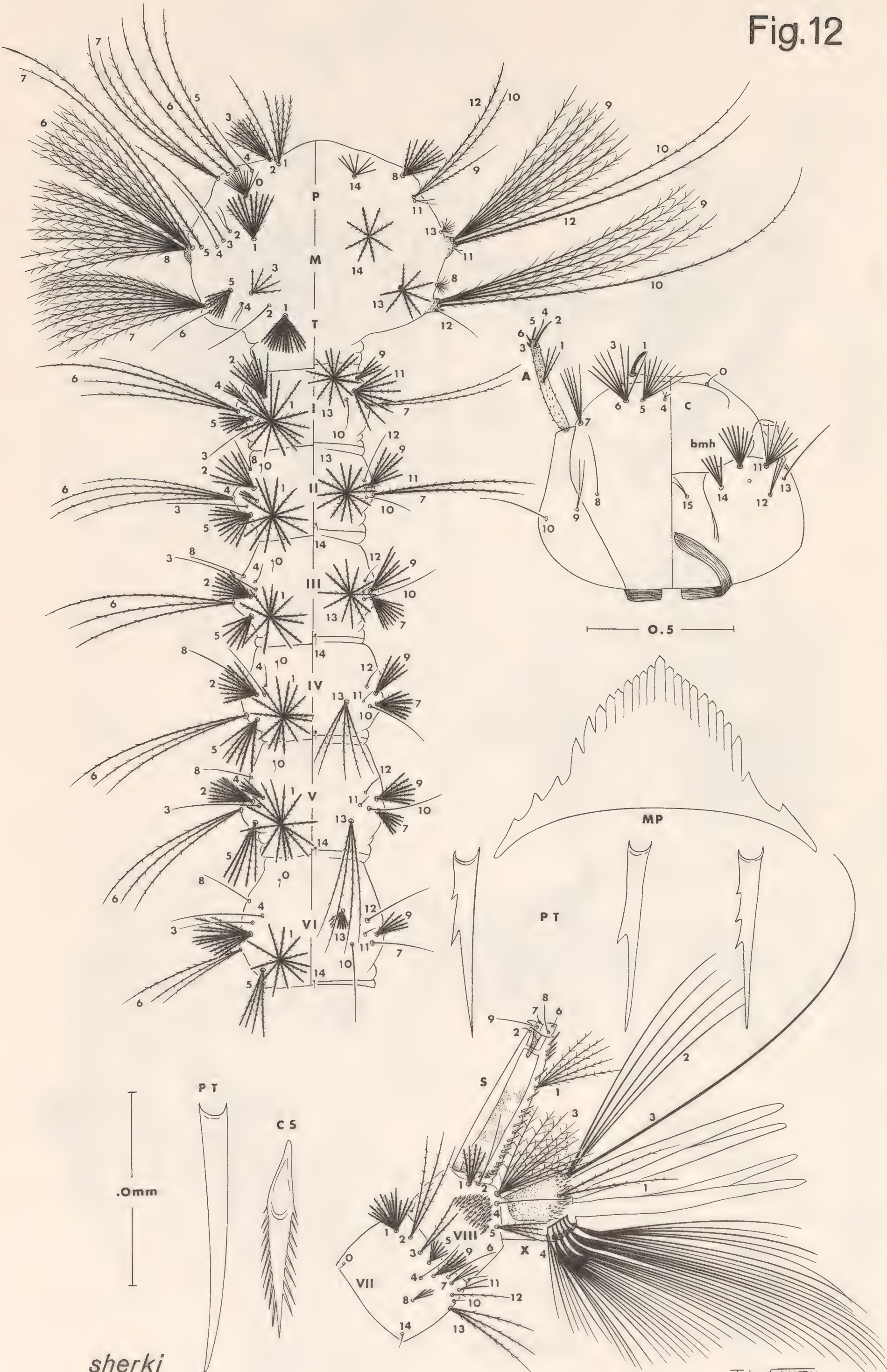
Fig. 11



saxicola

V. MALIKUL

Fig.12



sherki

J. L. SMITH

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